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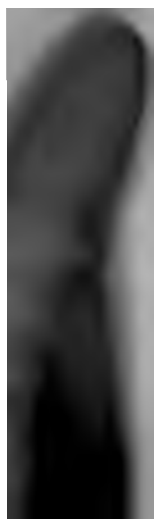
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OUTPOST DUTY
MILITARY RECONNAISSANCE
ROAD MAKING

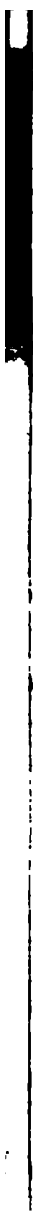
*Major General
W. C. E. Napier.*



OUTPOST DUTY.



**TREATISES ON MILITARY RECONNAISSANCE,
AND ON ROAD MAKING.**



OUTPOST DUTY.



TREATISES ON MILITARY RECONNAISSANCE,
AND ON ROAD MAKING.

LONDON: PRINTED BY WILLIAM CLOWES AND SONS, STAMFORD STREET
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OUTPOST DUTY.

BY

GENERAL JARRY.

TRANSLATED FROM THE FRENCH.

TO WHICH ARE ADDED

TREATISES ON MILITARY RECONNAISSANCE
AND ON ROAD MAKING.

BY

MAJOR-GENERAL W. C. E. NAPIER,

VICE-PRESIDENT OF THE COUNCIL OF MILITARY EDUCATION.



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CONTENTS.

	PAGE
TRANSLATOR'S PREFACE	vii
AUTHOR'S PREFACE	ix

SECTION I.

Advanced guards—Tracing out the camp and posting the picquets—Cavalry picquets—Infantry outposts to be behind obstacles—Mutual support of outposts—Watching a river—Intermediate posts	1—12
--	------

SECTION II.

The duties of an officer in command of an infantry outpost—Patrols—Mounted orderlies—Strengthening an outpost—Communications—Honours paid by outposts—How the enemy's attempts to dislodge the picquet are met—Reception of a flag of truce or deserters—Other visitors to the outposts—Visiting the sentries—Retreat of the enemy—Use of cavalry with the outposts—Withdrawal of the outposts—Felling trees on the line of retreat—Approach of an enemy—Guarding a river—Day report—Patrols—Precautions by night—Precautions against a night surprise—The picquet guard—Repelling an attack by night—Knowledge of the ground essential—Reception of detachments returning to camp—Reception of deserters by night—Departure of the army in the night—Exceptions to the rule of withdrawing posts of observation at night—Signs of the enemy's retreat—Noises at night—Retreat of the picquets during the night—Posting a picquet in the night—Re-establishing the day picquets—Relieving the picquets—Concluding observations	13—58
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TRANSLATOR'S PREFACE.

THE translation, in the present day, of a work upon outpost duty written in the beginning of this century, and doubtless founded upon the experience of the wars of Frederick the Great, demands some explanation.

The following is offered in justification of what may appear to be a work of supererogation.

The principles of outpost duty (which is simply the manner of protecting an army when encamped, or bivouacked) are the same in all armies and at all periods. A work, therefore, which gives sound and practical directions upon the subject may be studied with advantage, although it be half a century old and based upon the practice of a foreign army.

This book of General Jarry's appears to me to be one of the most practical that I have met with, and gives details respecting the duty of an officer in the examination of his ground, the posting of his picquets and sentries, the strengthening of his post, and the manner of conducting his retreat upon the main body, which are not to be found in the concise instructions contained in the section on Picquets in our "Field Exercises and Evolutions of Infantry."

Treatises upon outpost duty have, it is true, been written, or translated, at various times by English officers ; but most of them are now out of print. It appeared to me, therefore, that there was still room for the present publication ; and it also gave me the opportunity of making public two small pamphlets upon " Reconnaissance," and " Road-making," originally compiled for the use of the officers of the Staff College, but which I hope may occasionally prove useful to other officers.

General Jarry was formerly in the Prussian army of Frederic the Great. He afterwards came to England, and was appointed Commandant of the Senior Department of the Royal Military College at High Wycombe, where he instructed the officers who were studying for the Staff, in the higher branches of the military art.

I have made, in the shape of foot-notes, such remarks as the difference between our military system and that of foreign armies, in some of the details, seemed to require.

WILLIAM NAPIER.

AUTHOR'S PREFACE.

LIGHT troops are usually employed in the outpost duties of camps.

Whatever may be the nature of the ground, these duties are always arduous; but they become infinitely more important, as far as the infantry is concerned, in proportion as cavalry can be the less employed on them.

In enclosed wooded countries, whose surface is varied by successive hills and valleys; where the view is obstructed by woods, plantations, clumps of trees, or scattered houses; where the fields are enclosed by high growing hedges; where ditches, ponds, marshes, &c., exist; under such circumstances, when almost the whole of the outpost duties can alone be performed by a numerous light infantry,* the many details of this service seem to require that special rules should be laid down, in order to enable light infantry to perform the duties of cavalry, whenever

* In the British army every regiment is trained in the duties of light infantry: the observations in the text do not therefore apply, with us, exclusively to light troops; nevertheless on active service we have usually formed a "light division," which has always taken a large share of the duties of the advanced guards and outposts.—TR.

the employment of the latter is restricted or entirely prevented by the nature of the ground.

It is, therefore, necessary that every infantry officer should diligently study those parts of the art of war which relate to the protection and safety of armies, whether on the line of march, or in camp ; to the operation of foraging ; the escort of convoys ; the levying of contributions in kind ; the seizure of prisoners, hostages, &c., &c. ; and especially the reconnoitring of the posts and positions occupied by the enemy ; and the giving notice of every march and movement which he may make, either with his whole force or by detachments.

Great misfortunes have often been caused in war by the want of sufficient instruction in officers of subordinate rank.

It is, therefore, the duty of every man of honour to qualify himself to discharge with precision and distinction the duties which are entrusted to him and the obligations which he owes to his country.

He who commands, in any rank whatever, should know that command is alone honourable to him who has made himself worthy of it. Then it is that ambition is praiseworthy ; that emulation, guided and sustained by military talent, becomes useful to one's country ; and that a well-merited reward becomes a priceless honour.*

Ignorance of military duty leads to faults, a single one

* This sentiment is recommended to the particular attention of the British officer. There is a great desire for promotion among officers, but the wish to *qualify for command* is not always equally conspicuous. The only way to qualify for command is by the constant study of one's profession. This rule applies to all professions, and it is hard to conceive how the idea ever arose that it may be neglected in the military profession.—TR.

of which is sufficient to cause the loss of all reputation, and to banish for ever that confidence which should exist between him who commands and him who obeys, and upon which the success of the most glorious actions depends.

The duties of light troops being, above all others, performed by small detachments, generally commanded by a single officer, instruction becomes the more necessary for him, inasmuch as he depends entirely upon himself, and that in this isolated service there arise many dangerous occasions from which he can only extricate himself with honour by combining military knowledge with valour.

One very necessary care in an officer of light troops is to endeavour to know individually the kind of men he has under his command, so that he may employ them in the manner most suitable to their degree of intelligence and courage.

Such a sergeant, corporal, or private, will be best fitted for openly reconnoitring the enemy ; that is, approaching him so as to be able to observe, with some exactness, the position he occupies and his strength.

Another will be better fitted for the duty of "watching," which consists in observing well without being seen. Another for gaining intelligence from the country people, by questioning them about the various uniforms and regiments ; the names and nature of the places which the several corps occupy ; how far their patrols extend ; how they have protected themselves ; and about the abundance or the deficiency of supplies, forage, &c., &c.

Another will possess the talent of laying ambushes, and the necessary skill for seizing prisoners without compromising himself.

Others have infirmities ; among which those of the sight must be particularly noticed. A man who sees well enough by day may see very badly by night.

Among old soldiers there are some who are full of resource, and who, having taken note of certain situations and occurrences, are capable of giving a sound opinion. Such men should be turned to good account.

And as there exist also timid, ill-conditioned men, easily alarmed, it is even important to know these, so as to avoid employing them in situations where they might communicate their fears to others.

Their several characters can readily be discovered by talking to the soldiers, and, above all, when receiving their reports.

If it be necessary for an officer of light troops that the men under his orders should have every confidence in his foresight, his firmness, his knowledge, it is also a great advantage to him to gain their affection. He must know that his sword alone cannot do everything ; that if he be not cordially supported in a service where zeal chiefly leads to success, he can neither undertake nor accomplish any operation with safety to his own reputation.

He must, however, take care not to purchase the affection of his troops at the expense of discipline. It is the more necessary to maintain discipline among light troops, because they have greater opportunities of infringing it.

The best way of gaining the affection of the soldier, without injury to good order and discipline, is to provide carefully for his necessities. It may sometimes be said with respect to soldiers that "necessity knows no law ;" but

law begins where necessity ceases, and it is not by permitting individual pillage that troops can be fed.

An officer should also know how to distinguish between those occasions which require extreme vigilance and those in which he may dispense with unnecessarily fatiguing his troops. This sort of consideration gains the affection of the soldier, who will never complain of an extraordinary exertion when he believes it to be necessary for his own safety.

If drunkenness be everywhere out of place, it is far more dangerous and misplaced at the outposts than elsewhere. The disgrace of having been surprised for want of taking ordinary precautions, can never be effaced or pardoned. Sobriety is a virtue which must be upheld by example. An officer who gets drunk can hardly, in conscience, punish a soldier who is in the same state.

The greatest disgrace for an officer of light troops is to have the reputation of being a lover of booty and plunder, and of turning his profession into a piratical speculation. With such officers it would be impossible to maintain discipline. This dishonour would not fall on them alone, but (which is more grievous) upon the nation to which they belong.*

Liberality and generosity are not military *talents*, but *virtues*, without which military talent cannot attain that high degree of glory and reputation which leaves nothing to be desired.

The service of light troops purged of all that is repug-

* These observations about drunkenness and plundering (however true in themselves) are, happily, not applicable to British officers.—T.R.

nant to honour and morals,* and of all that is useless to the object of the war, has always been considered the best school for officers who do not wish to vegetate and die in the rank they hold, or in one slightly higher, which is the limit of their ambition. The military career has no bounds for those who possess great talent; and fortune often showers her favours even on men of mediocre talent when they are animated by zeal and honour.

It is especially in the school of light troops that an officer learns to examine carefully the nature of the

* The famous hussar Trenck was not deficient in military talent; nevertheless, his end is an example in point.¹

It must also be observed that the proceedings of war are not always in accordance with ordinary morality. Success is the first consideration in war, and success often depends upon the sacrifice of what is due to humanity.

A country is devastated; the innocent and unfortunate inhabitants are completely ruined in order that the enemy may not be able to subsist in it and may thus be prevented from continuing the war. In such a case the cattle, the corn, the forage, are carried off; what cannot be taken away is burned. But while acting thus in an enemy's country, the women and the maidens should not be violated, nor should the inhabitants be tortured with the view of discovering where they have hidden away a little money; nor should their clothes, utensils, or furniture (from which the enemy can derive no advantage) be taken from them. In war, the question is not to distinguish theoretically between abstract justice and injustice, but between what is and what is not necessary to the object of the war.

¹ Baron François de Trenck was a colonel of Irregular Cavalry (Pandours), in the service of Maria Theresa of Austria. He was a man of gigantic stature, great strength, reckless daring, and considerable military talent. He was much distinguished as a partizan leader in the Seven Years' War; but his rapacity, cruelty, violence, and love of plunder, were so notorious, that he was at last brought to a court-martial, and sentenced to be imprisoned for life in the citadel of Brünn, where he destroyed himself by poison at the age of thirty-eight.—Ta.

ground, so as to adapt his dispositions to it, and where he learns to distinguish between what may be injurious and what may be favourable to the object in view.

It is the school of precautions, whether for attack or defence; and, above all, it is the school of foresight in the frequent retreats to which light troops are forced by the various movements of the army.

A retreat conducted in presence of a superior force with all the order, dispositions, coolness, and prudence which circumstances permit, is one of the things which particularly denote the real soldier: it is one which deserves to be specially noticed by general officers, and which is best calculated to gain their confidence for more important enterprises.

It is under such constantly varying circumstances that an intelligent and brave officer soon finds an opportunity of distinguishing himself. It is seldom that a subaltern officer can find such an opportunity in battles and general actions. The glory of great battles falls to the share of the generals alone, and even for them the opportunities are not frequent.

Having shown that the service of light troops is the most rapid and surest road to distinction and honours; having also pointed out some indispensable rules with respect to the discipline and the moral character of the soldier; it will be seen in the following instructions how an officer should behave upon every occasion before the enemy* in order to deserve and to obtain that reputation for skill which is so justly prized by the true soldier.

* That part only of General Jarry's work which relates to *outpost duties* has been given in this translation.—TR.

It has been said in the Preface that light troops are usually employed on the outpost duties of camps, and that the duties of the cavalry and the infantry in this respect are more or less arduous and important according to the nature of the country.

In speaking more particularly of the duties of light infantry as regards the protection of armies, and in distinguishing them from those of the cavalry, it is, nevertheless, necessary to establish the general relations which exist between the two services; and it is proper, for this purpose, to consider the *ensemble* of a camp and the manner in which it should be protected, so that every one may have a complete idea of the duties he will have to perform, according to circumstances and the nature of the ground.

ON THE OUTPOST DUTIES OF CAMPS

AND THE

PROTECTION OF ARMIES.

THERE are several kinds of Outpost Duties in connection with the main body of the army, which may be considered separately.

In the first section will be comprised all that relates to the chain of posts which surrounds a camp.

SECTION I.

OF THE GUARDS, OR OUTPOSTS, WHOSE DUTY IS TO PROTECT THE CAMP AND TO WARN IT AGAINST SURPRISE.

Advanced Guard.

When an army marches from one camp to another it is preceded by an advanced guard. Its flanks, when marching, are covered, according to circumstances, by a greater or lesser number of light troops, disposed with reference to the situation of the enemy. It is followed by a rear-guard.

When the advanced guard reaches the ground where the army is to encamp, the flanking parties halt and con-

tinue to cover the line of march until the army, with its baggage and all its followers, has entered the camp; that is to say, until the arrival of the rear-guard, which brings up with it all stragglers. Then the flanking parties close up in succession, and either enter the camp with the rear-guard or proceed to such posts as may have been previously assigned to them.

Tracing out the Camp and Posting the Picquets.

The advanced guard is usually composed of all the troops, both cavalry and infantry, which are to form the chain of picquets on the front and flanks of the new camp. Sometimes this advanced guard is reinforced by a body of troops intended to encamp separately in front of the main body, or for some other purpose, according to circumstances; but, whatever its strength, the advanced guard is always followed by what is called the "camp colour party." This consists of the quartermasters and camp colour-men of regiments provided with camp colours and everything necessary for tracing out the camp.*

The new guards and the "camp party" are under the orders of the general of the day, whose duty is to point out the situation of the camp and to post the picquets. This officer, after having given the alignment of the camp, marked its right and its left, and pointed out the "head-quarters" to the staff officers charged with the details of laying it out, advances with the picquets, and the brigadiers and field officers of the day, as far as he thinks proper, in order to examine and search the ground, so as

* With us the camp party would also be accompanied by the assistant-quartermaster-generals of division (or their deputies), who would take up the ground for their respective divisions.—T.B.

to ascertain that there are not in the neighbourhood any parties of the enemy, either large or small, hidden in any manner whatever. After this preliminary examination he informs, as soon as possible, the officers entrusted with the tracing out of the camp that they may begin their operations. While thus riding over the ground he considers what should be the extent of the chain of outposts; he points out to the brigadiers and field officers of the day who accompany him the principal points of its *enceinte*, such as the heights, woods, villages, and houses by which it is to pass; the streams and valleys which are to be left in front of it and which are to be watched. He also shows them how far the flanks of the chain are to extend, and where they are to rest, or whether, for want of proper points of *appui*, it is to overlap the camp more or less towards the rear.

This portion of the chain, which is intended to confront the enemy on all the approaches to the camp, must be distinguished from the guards which are placed in rear of the army, and whose particular object is to prevent the troops from wandering from the camp for the purpose of marauding or of deserting. These kind of "police" guards are posted after those which form the chain of outposts.

The extent and situation of the chain depend upon various considerations.

The first is the distance that the camp may be from the enemy.

The second has reference to the wants of the army. If the troops are to procure their forage, straw, wood, and even water, from beyond the front of the camp, the chain must be proportionately extended, and so placed as to

cover and protect the troops while they are providing themselves with what they require.

A third consideration, (which is, however, but a consequence of the first,) is that the most advanced posts should not be quite out of sight of the camp, in order that they may be promptly supported in case of attack. When the nature of the ground does not allow of this rule being altogether observed, it is remedied by encamping or bivouacking some small bodies of troops, either infantry or cavalry, between the camp and the most exposed parts of the chain.

These several considerations are not always easily adapted to the nature of the ground. Be that as it may, it is the business of the general of the day to determine the situation and the extent of the chain, according to circumstances, and to post the first cavalry guards.*

In the case of a large army, the extent of the chain being considerable, the general of the day, to expedite the work, divides the details of placing the guards among the brigadiers and field officers of the day who accompany him, dividing the chain into right, centre, and left, or only into right and left, and limiting, by some visible object, the extent of each of these divisions.

It is the duty of the brigadiers and field officers of cavalry to complete the examination of the ground,† and to ascertain more carefully that there are no hostile parties hidden in front of the army along the chain; as

* In order to mark out the chain with greater precision, the general of the day should be assisted in this duty by some officers of the general staff, who, at the same time, may make a sketch of the ground, noting its chief features and marking on it the number, the strength, and the situation of the outposts.

† That is, when the country is open, and cavalry guards can be employed in it.

also to place upon the line pointed out the guards and outposts of cavalry. The infantry brigadiers and field officers of the day are charged with the duty of posting the infantry intended to protect the camp in those places which cannot be occupied by cavalry, and also those which are intended to cover the night positions of the cavalry, according to circumstances. This should be done in concert with the brigadiers and field officers of cavalry.

As each officer finishes his task, he makes his report to the general of the day, handing to him in writing the state of the picquets, both as to the number of men employed at each post, and as to the roads, villages, woods, and heights where the picquets are posted.

It is then the duty of the general of the day to visit these several posts, and to make whatever changes he considers necessary.

After this inspection he makes his report to the general commanding in chief, to whom he also hands a written state of all the main guards and picquets, in order that the duties may be divided among the different regiments * of the army, and that a copy of this state may be given to the general of the day who relieves him.

Such are the general arrangements with respect to the

* When the army has sufficient light infantry¹ to furnish all these outposts, the regiments in camp only furnish the camp-guards which must be distinguished from the outposts which form the chain. These camp-guards² are only from 15 to 18 men strong, and are placed at about 100 paces in front of the centre of each battalion of the first line, and at the same distance in rear of the centre of the battalions of the second line. The cavalry in camp has likewise its camp-guards.

¹ We make no such distinction between light and other infantry.—Tx.

² Our regimental rear and quarter-guards.—Tx.

chain, but there are others peculiar to the nature of the ground which require to be noticed in more detail.

In fixing the position of the chain, care must be taken to comprise within it, as far as possible, the heights whence the camp might be overlooked, its strength, extent, and arrangements ascertained, and what is going on in it be seen. If the chain cannot conveniently be extended so far, a separate detachment must, if possible, be placed on such height, the necessary precautions for supporting it and securing its retreat being observed.

It is disadvantageous to carry the chain through a wood; the posts should as much as possible be placed on the outer edge which faces the enemy; and if, from the extent of the forest or wood, this cannot be done without increasing too much the number of posts, or weakening the chain, the picquets should then, if possible, be placed across the wood along a high road or the course of a stream or valley, which will enable the picquets to see better to their front.

If the inside of the wood is very thick, without roads or streams running in the direction of the chain, the wood must be left in front, keeping it a little beyond musket-shot, and establishing within the wood and on the roads inside it small posts of infantry, or patrolling parties, to give notice of the enemy's approach both by day and by night.

If the chain were carried through a thick wood where the sentries could neither see nor stop spies and deserters, the first principle of outpost duty would be violated. It is therefore better in such a case to leave the wood in one's front. It might, however, happen that the skirt of the wood was too near the camp; it would then be indis-

pensable to cross it with the chain, either by quickly constructing an abattis, or by multiplying the infantry posts as much as is necessary.

Cavalry Picquets.

In posting the cavalry picquets, care must be taken that the main guard (or reserve) cannot be seen by the enemy. With this object it is placed in some hollow, or on the reverse side of a hill, or behind a clump of trees, or a house, at about eight or nine hundred paces in rear of the line of vedettes.

Between the main guard (or reserve) and the vedettes are placed the picquets, at about three hundred paces from the vedettes,* but so that the picquet can be distinctly seen from the main guard (or reserve), and that the picquet can in like manner distinctly see all its vedettes.

Each vedette also must be able to see the next vedette on his right and left; and one or other of two neighbouring vedettes must be able to see the ground between them, so that nothing can pass without being seen and stopped.

This essential rule constitutes what may be called the principle of the formation of the chain; and in order to prevent spies and deserters from passing through it, the vedettes must be double, so that one of them may leave his post for the purpose of arresting any person endeavouring to enter or to leave the camp; otherwise a single vedette, not being able to quit his post, would be

* This would answer to our "supports" and "reserves," and applies to infantry as well as to cavalry outposts.—Tr.

obliged to call out to the picquet, and before it arrived the spy or the deserter might escape under favour of some cover.

When local circumstances oblige one to place a vedette at a greater distance from the picquet than is usual, the vedette must also be double; because, although it may be distinctly seen from the picquet, it may not be easily heard. In this case one of the vedettes goes and warns the picquet of what is going on in front, in order that the picquet may advance and reconnoitre—sending instantly the same notice to the reserve.*

In posting vedettes, care must be taken not to place them too near the edge of a wood, or of any cover which might be occupied by the enemy. They should be full six hundred paces off.†

It often happens that, from the nature of the ground, a single advanced post is not enough to see and communicate with all the vedettes which the picquet must furnish. In this case the vedettes are divided so as to communicate with a second picquet, which likewise must be within sight of the main post (or reserve).

Great attention is necessary in the distribution of the outposts, in order to combine an efficient performance of the duty with the smallest number of troops which can conveniently be employed on it, as this is one of the most harassing duties of cavalry.

With respect to vedettes, they should be more particularly placed on heights, and in places whence they can

* In our service a vedette does not usually leave his post, but warns the picquet of the approach of the enemy by "circling" his horse according to certain fixed rules.—Tr.

† Possibly further in these long-range days.—Tr.

see furthest, as well as at the junction of roads, and at points whence they can look into ravines, hollow roads, and every kind of defile in front of the chain. If there are one or more trees within reach, from the foot of which everything can be seen, advantage should be taken of them to hide the vedette from the enemy; but in order to see everything, and to see well, it is often necessary to give up the advantage of not being seen.

Infantry Outposts to be behind Obstacles.

With respect to the infantry reserves and picquets, they should always be placed so as to be covered by some natural or artificial obstacle.

Natural obstacles are—a church, a cemetery, a garden surrounded by a wall breast-high, or by ditches full of water; any place, in short, which is not commanded within musket-range, and which is surrounded by a strong hedge difficult to get through, &c., &c.

Artificial obstacles are those which require some labour to prepare them—such as an “abattis” of trees, with which a kind of enclosure is made; a wall which has been loopholed; a ravine or hollow road on the near side of which a parapet has been raised; in short, any intrenchment with a ditch, the earth of which has been formed into a parapet.

The position of the infantry picquets is the same by day and by night.* There should be a picquet at the head of

* Not necessarily so. In our service, it is usual to draw in the picquets closer to the camp at night, so as to diminish the extent of the chain and to bring the sentries closer together.—Tt.

every defile or passage through which the cavalry would have to retire.

Mutual Support of Outposts.

The cavalry and infantry picquets should mutually support one another ; and wherever the infantry is in the first line in the chain, the sentries to the right and left should see and be seen by the nearest vedettes.

If at night the cavalry picquets are withdrawn behind the infantry outposts, they throw out vedettes on their flanks and to their rear for their own safety ; and they send out beyond their front direct and lateral patrols.

Should the country be so open and bare of hedges and houses that no infantry posts can be established, the cavalry picquets will draw in a little nearer to the camp when the night is quite dark. It is the business of the superior officers who are charged with the details of the chain to point out to the cavalry picquets their posts both by day and by night.

Watching a River, &c.

When the cavalry picquets are on the bank of a river, or stream, or marsh, the fords and the nature of the bottom must be carefully examined.

If the stream or the marsh is fordable at all points, the cavalry picquets generally withdraw at night to the posts which have been pointed out to them.

If the stream can only be crossed at certain fords and by the bridges ; if the marsh can only be crossed by certain roads or paths ; these must be ascertained, in order

to place vedettes opposite these places of passage. In such circumstances the picquets occupy the same posts during the night, and the vedettes, as soon as it is dark, approach quite close to the places of passage. If the bridge is a wooden one, the planks are removed, but in such a way that they can be replaced if necessary.

If the banks of the river are very much enclosed, and its bed is not fordable, it would be better to place infantry picquets opposite the passages, rather than cavalry; and these infantry picquets should entrench themselves according to local circumstances.

If the stream were passable in too many places, with an open plain in rear, it should be watched by cavalry; but then the vedettes during the day should keep out of musket-shot from the bank of the river.

Intermediate Posts.

When the chain, for some reason or other, extends beyond the distance where, in the event of attack, the picquets could be easily supported by the troops in camp, the most distant points are supported by bodies of infantry or cavalry intermediately encamped, and conveniently placed either with respect to this object or with reference to the ground on which they are to act.

In other cases it happens that outlying parties are pushed beyond the chain, to a greater or lesser distance, whose duty it is to watch the movements of the enemy and to gain the earliest intelligence of them. But these irregular arrangements are not included in those of the chain, of which every portion should be united and joined together, so as to form a line impenetrable to spies and

deserters, and capable of preventing the enemy from reconnoitring.

The duties detailed in this section are usually divided between the cavalry and the infantry. In the following section will be considered the special conduct of infantry officers in the outpost duties which they may have to perform.

SECTION II.

It has been already stated that in some countries the ground is so unfavourable for cavalry that almost the whole of the outpost duties devolve upon the infantry.

The following instructions are based upon the supposition that, from the nature of the ground, all the precautions relating to the protection and safety of the army are to be undertaken by the infantry.

ON THE DUTIES OF AN OFFICER IN COMMAND OF
AN INFANTRY PICQUET OR OUTPOST.

The picquet having arrived at the place marked out for it in the chain of outposts, the officer in command will post in front and in rear the sentries that are immediately required, nearest to the post, subject to certain changes to be made when his arrangements are completed.

During this time the picquet will remain under arms, facing towards the enemy.

On his return the officer will take with him about a third of his party, and make a close examination of every part of the chain which is entrusted to his care and supervision.

During this reconnaissance the remainder of the party will remain under arms.

The officer in command of the picquet either is or is not acquainted with the ground.

If he knows the ground he will make his arrangements accordingly.

In any case he will find it useful to be provided with the best map of the country that he can get, and with a good telescope.

If the country is unknown to him, his first step will be to procure some of the inhabitants of the place as guides. He will send for them to the nearest houses or village.

Accompanied by these guides, he proceeds to the right of his ground, that is, to the spot whence his first sentry on the right shall be able to see the first vedette or sentry on the left of the next post, and in such manner that nothing can pass between them without being seen and stopped, if necessary.

While making this reconnaissance and his various arrangements he will be accompanied by some small parties, of two or three men each, who will keep at two or three hundred paces from him, so as to warn him of anything which may approach his front or flank. He will then take his map in his hand and question his guides about the neighbouring objects marked on the map, and about all other objects which he can see: thus he will carefully ascertain the names of the villages, detached houses, woods, streams, heights, or mountains, &c. If he can draw he will make a small eye sketch,* marking on it the name of the objects which he has ascertained, as well as the situation of each of his posts; or he will write the names of these several objects in his note-book in the shape of an itinerary, with their respective distances; so

* This is one of the many occasions on which a knowledge of military drawing will be found useful to a young officer.—T.R.

that he may be able to answer any questions which may be put to him by the generals when they visit the outposts, as well as to be the better able to take his measures in case of attack.

He will question his guides about all the roads and paths which are within the limits of his post, so as to know where they lead to. He will also ascertain from them the nature of these roads from his post to the nearest villages; whether they are practicable throughout for carriages, and, consequently, for guns; whether there are any defiles, ravines, hollow roads, marshes, or woods to be passed through; whether there are any streams to cross; whether they can be crossed by fords or bridges; whether the bridges are of stone or of wood; whether the streams are fordable at all points, or only at the crossing-places.

Going thus from right to left of his ground he will make use of his information in posting his sentries and such small detached parties as may be necessary.

It has been observed that all the vedettes and sentries in the first line of the chain should be double; and the reason of this has been stated.

When the sentries can be distinctly seen from the picquet as far off as about 300 paces, it is sufficient to post double sentries, as has been said; when they cannot be distinctly seen from the post, or when they are farther off than 300 paces, it is well to place at such points a small post of observation consisting of a corporal and four men.*

This small post should be placed behind a hedge or within the edge of a wood, so as not to be seen by the

* Not more than a corporal and three.—TR.

enemy; and it will be sufficient to post in front a single sentry, who should not be more than from fifteen to twenty paces off.

In this case the sentry, being so near the post, can easily warn the corporal of what he sees, who, having ascertained what is going on, immediately sends one of the party to inform the picquet.

The small post relieves its sentry at the usual hours by day and by night.

The officer in command, in distributing his posts and sentries according to the information he has received from his guides, and with reference to the nature of the ground, will take special care not to neglect any of the approaches by which the enemy could come suddenly upon him; and when placing his posts and sentries, he will point out to them the roads, ravines, woods, valleys, heights, houses, and villages, upon which they should constantly keep their eye. The sentries of the advanced post who are in the first line must remain motionless and facing towards the quarter pointed out to them; they are not allowed to walk about like a sentry over a guard house. Light infantry men during their tour of duty at the outposts must not shoulder or slope their arms, but carry them, like sportsmen, in the hollow of the arm; they may also order their arms. The reason is, that by raising and moving their rifles they are liable to be seen; and every man who is placed in observation should try as far as possible to see without being seen.*

The system of double sentries is also useful when from

* It is not stated in the "Field Exercise" how picquet sentries are to carry their arms; but I believe the usual way is without bayonets, and at the "trail."—Ta.

the same point several objects in different directions have to be watched. One sentry then watches one quarter of the circumference of the horizon while the other watches the other quarter. The sight of a man without turning the head can only embrace 90 degrees.

The officer in command having instructed his posts and sentries as to what they are to do and to watch, will also desire the smartest of the two sentries to come quickly to warn the picquet of all they may see and discover.

In detailing the small posts and sentries it is requisite that the whole number of men thus employed in guarding the ground should not exceed the third, or at most the half, of the number composing the picquet. Reckoning a corporal and four for each small detached post, and two men for each double sentry, there may be three or four small detached posts and five or six double sentries in the extent of ground to be guarded. This would require 32 men, of whom 12 only would be relieved by the picquet.

Consequently the picquet should be at least 60 men strong, without counting the officers and sergeants, so as to furnish and support, if necessary, that number of posts and sentries upon a front of from 1,500 to 1,800 paces, reckoning 200 or 300 paces between each post or sentry; that is to say, in an enclosed country crossed by many roads it would require about 80 men to guard strictly an English mile of the chain of outposts.*

The reconnaissance and distribution of the posts being

* This seems to be hardly sufficient. A mile of enclosed country would probably require 12 double sentries, and four or five small parties of a corporal and four: consequently, the picquet should not be much under 100 men, or, better still, two picquets of 50 men each, so that the sentries might be nearer to their picquets.—Tr.

finished, the officer in command will return to the picquets; and here it may be observed that these several details may occupy him for some hours; in which case, if all is quiet, and there is no appearance of hostilities, he may, as soon as he thinks proper, send word to the picquet to pile arms, without, however, allowing any man to wander from the post.

Patrols.

When the officer in command returns to the picquet, he may, according to circumstances and the uncertainty as to the proximity of the enemy, send out some patrols, consisting of a corporal and four.* He will instruct them where and how far they may proceed, and as to what precautions they should take, according to the information he has gained when making his reconnaissance.

The object of these patrols is generally to approach with caution any villages or single houses which may be upon the road indicated to them until there is an opportunity of speaking to the people of the country and questioning them closely as to their knowledge of the enemy: such as the position of his nearest posts; how far he generally pushes his patrols; if they know of any intended movements; if they have seen troops pass by either in large or small numbers, and in what direction they were moving. Should there be near the road any considerable hill whence a good view may be obtained, the commander of the patrol may send two men of his party who have good sight to examine what is going on around as far as the eye can reach, while he conceals him-

* Four men seem to be a better number for a patrol than three; because, when the corporal detaches two of his party he still has two men left.—Tr.

self in some appointed place till they return. Should an enemy's party approach them they can give notice by whistling in such a way as to be heard afar off, or by holding up something at the end of a pole.* They must then retire quickly under cover of the hedges and without deviating too far from the road. If during its tour the patrol should have discovered anything of interest, the officer commanding the picquet will inform in writing the field officer in command of that part of the chain; and in the case of any march or movement of the enemy which has been distinctly ascertained he will send notice direct to the general-in-chief at his head-quarters.

Mounted Orderlies.

In order that all messages should be carried quickly to their destination, it is requisite that with every infantry picquet there should be a few light dragoons, intended for this duty, and for certain other objects which will be mentioned hereafter.

Strengthening an Outpost.

It has been said that every infantry post in the chain should be protected by some natural or artificial obstacle.

The first duty of an officer in command of a picquet, on reaching his post, is to cast his eye over the ground to see what is required to place it in a state of defence. But as he cannot at the same time proceed to strengthen his post and to reconnoitre his ground, he must be satisfied, in the first instance, with taking some preparatory steps for this purpose; for instance, if he thinks it necessary to protect

* Or their rifle.—Tr.

any part of his post by an abattis he will mark out its site and extent, and will desire the officer who commands the post in his absence to procure from the neighbouring villages and houses the tools and even the men necessary for the execution of the work. If it be necessary to throw up a parapet, to barricade a road, to loop-hole a wall, &c., &c., he will give his orders accordingly.*

While he is examining his ground the necessary tools and workmen may be collected; on his return he can set them to work and point out more in detail what has to be done. In default of local labourers, the men of his party must be made to work.

To accomplish this object successfully in the various positions in which a picquet may be posted, every infantry officer should have some knowledge of field fortification, and should read carefully the small works which have been published on this part of military science.†

It is, however, well to observe upon this point, that a picquet must not be looked upon as a post of resistance. It is essentially only a post of observation; the defensive measures with respect to it are confined to the precautions necessary to avoid a surprise, or the being dislodged by an equal or slightly superior force; that is, to enable it to resist a hostile party, which should try to seize the post without penetrating further; for if it were a whole

* This matter of strengthening an outpost is not much understood by the ordinary run of English regimental officers; yet it is so important on active service that some practical knowledge of field fortification should be insisted upon in an officer. It might be practically taught at the several camps, and there are small works upon this subject, by Jebb and others, which would give the necessary information.—Tr.

† Jebb and others.—Tr.

column which was marching upon the camp, the duty of the picquet is not to stop the column but to give notice of its approach, taking steps to retire in good time without hurry; the officer in command having his detached posts on his flanks, and halting to fire upon the enemy wherever the nature of the ground and the circumstances of the attack allow him to do so without compromising the safety of his retreat.*

If the picquet is posted in a village in which there is a church, it must be ascertained whether the churchyard can be used as the chief post.

This depends upon the situation of the church with respect both to the roads which abut on the village on the side towards the enemy and to those which lead directly to the camp.

The chief post, or, properly speaking, the picquet, must not be placed so as to leave on its flank any roads by which its retreat could be cut off, or by which it could be attacked in rear; of all precautions this is one of the most necessary.

Should the churchyard not be properly situated in this respect, the picquet should be placed towards the skirt of the village on the side towards the camp—and in such a manner that all the roads which abut on the front and the centre of the village may be in front of the post. It will then be sufficient to barricade the road at this place, either

* Colonel Arenschild, who commanded the German hussars in our service in the Peninsular War, says that nothing can be worse in an officer commanding a picquet than to rush into camp helter-skelter with the enemy close at his heels. His retreat should be conducted in a leisurely manner, delaying the enemy as much as possible.—Tr.

by parapet of sods,* four feet and a half high, and from three to four feet thick at the top, with the slopes necessary to support it; or by carts, or planks, or thick poles passed between the wheels; or other materials which may be found in the village: a little in rear of this obstacle a parapet of earth and dung must be quickly constructed of sufficient height to screen the party from a sudden fire.

The same thing is done at all the entrances to the village towards the enemy; and behind each barricade is placed a small detached post, whose strength should be in proportion to the breadth of the road, reckoning for this momentary defence one man to every five or six feet.

Care must be taken, also, to secure a line of retreat for each detached post across the court-yards and gardens by which each small party may retire upon the piequet in the event of being attacked, without the risk of being cut off by an enemy who may have entered at some other side of the village.

Not only must there be detached posts at all the entrances to the village on the enemy's side, but double sentries must be posted round the gardens, particularly at the salient angles, and they must be so placed that the enemy shall not be able to enter the village by the gardens without being seen by day, and heard or met with by night.

This chain of posts and sentries should be regularly formed at the entrances to the village and round the gardens in front of the chief post; while on the flanks

* An impediment in the way of an abattis or barricade is all very well; but a parapet in such a position would serve as a shelter to the enemy after he had driven away the defenders.—T^r.

of the village there should be detached posts communicating with the other parts of the chain, whether they are furnished by the party occupying the village or not.

The measures for the defence of a post of resistance must not be here confounded with those simple precautions which belong to a post of observation such as a picquet, whose only object is to watch the movements of the enemy without losing sight of its own safe retreat and that of the small posts furnished by it.

It is the more necessary for an officer of infantry to turn his thoughts to the study of these combinations, inasmuch as the details for the infantry outposts cannot be settled by the superior officers as those for the cavalry can. The latter being employed in open ground, the general officer who selects the line of outpost can go direct from post to post, and place on the way such vedettes as he considers necessary. But in an enclosed country where one can only ride along the roads, this would involve too many twistings and turnings. In such cases, the superior officer can hardly do more than fix the place of the picquet and the extent of ground it is to guard. The rest devolves upon the officer in command of the picquet. If the superior officers of the day were to arrange all the details of the infantry posts, the consequence would be that the chain could not be completed for a very long time, and that the army would remain too long uncovered and subject to much inconvenience.

The picquet may be placed in a farm or isolated house.

In this case the officer in command will see what is necessary to be done in front of the post.

It would be well that in this direction a clear view should be had for some hundreds of paces, and, therefore,

if any trees interrupt the view, he will have them cut down as abattis. If there are hedges, he will have them cut down to two or three feet above the ground, so as to be able to fire over them.

He will pay particular attention not to leave any openings on his flanks, by which the post might be turned and attacked in rear.

A picquet must not shut itself up in a house, court-yard, or garden, with the intention of resisting to the last.

It may defend itself until its flanks are attacked; but the moment the enemy prepares to surround the post it should immediately begin to retreat.

It is to secure and cover this retreat that it is necessary to construct works and establish posts, and to take advantage of the nature of the ground, to obtain means of retreat which are unobserved by the enemy; so as to gain, without being cut off, the road by which the party must retire upon the camp or upon some particular position which has been marked out for it.

Communications.

The officer in command will in like manner establish the necessary roads of communication with his posts and sentries, causing gaps to be cut in the hedges within the chain. This precaution is always useful, even though there are roads already existing, because the enemy may seize the road; in which case it is well to have some other means of communication.

These communications should be established during the day, so that they may be used at night.

A passage must also be constructed for the lateral patrols from one post to another at two or three hundred

paces in front of the posts and sentries across the fields and hedges, and the skirts or the interior of woods, as the case may be.

Circumstances and situations are not always the same ; but there are cases in which the greatest precaution and vigilance are necessary to avoid a surprise.

However much may be said on this head, it will be found in practice that it is difficult to say everything.

Honours paid by Outposts.

The honours due to general officers and armed parties which pass near the picquets are laid down in the Regulations. To fulfil this duty, picquets must have a sentry in the direction of the camp.

How the Enemy's attempts to dislodge the Picquet are met.

It frequently happens that the enemy's generals, wishing to reconnoitre the ground, approach the chain under an escort more or less strong, with which they cause the outpost to be attacked, in order to dislodge it from the hill, to which they then proceed in person for the purpose of reconnoitring the camp and neighbourhood.

As soon as the officer commanding the picquet is warned by his sentries of their approach, he will instantly inform the superior officer, under whose orders he is ; there being always with the picquet a few light cavalry horses for this sort of duty. If the picquet itself is attacked, it will do all it can to hold its ground, and to prevent the enemy from obtaining complete possession of the height and making his reconnaissance.*

* In the Peninsular War, the picquets did not usually attempt to prevent the temporary occupation of a height by the enemy for some

If the attack is upon one of his posts which is detached to a certain distance, he will take some of his party and will move to the support of the post attacked, doing his best to dispute the ground until the arrival of whatever support he may have reason to expect.

If there are any crack shots or riflemen with the picquet, he may, on such occasions, make good use of them by ordering them to fire at any one who may advance singly to reconnoitre.

Reception of a Flag of Truce or Deserters.

If a bearer of a flag of truce coming from the enemy's camp should present himself either alone or accompanied by an officer, as soon as they are seen or heard, one of the sentries will go and warn the picquet. As soon as he can be heard by the bearers of the flag of truce, the other sentry will order them to halt and to face in the direction whence they came. It is to be presumed that the bearer of a message understands, either himself or by means of the interpreter who should accompany him, the language of the country or of those whom he addresses. Until the return of the detached sentry, the remaining sentry should prevent them from looking towards the camp, threatening to fire upon them if they do not obey his orders.

The officer of the picquet being warned, will either go in person or will send a sergeant to ascertain the object of the flag of truce.

special purpose. The soldiers on both sides had come to a tacit understanding that on such occasions they were mutually to give way on a signal from an enemy's party that they wanted temporary possession of the hill.—Tr.

Sometimes it is merely a letter or a parcel, which may be delivered without further ceremony.

At other times it may be an answer or a message which an officer is charged to deliver.

In this case the officer of the picquet will proceed to his outposts, and will cause the messengers' eyes to be blindfolded; or he may send, in his stead, a non-commissioned officer with orders to conduct them, with their eyes blindfolded, to the picquet.

He will report the circumstance to the general of the day, and will await his orders to send the messengers into camp.

The small detached posts and the double sentries will behave in a similar manner with respect to any deserters who may present themselves at the outposts.

The commander of the small detached post will go to the deserters and cause them to deliver up their arms, keeping them meanwhile beyond the chain of sentries. He will at the same time inform the picquet officer of what is going on, and of the number of deserters, in order that the picquet may send a detachment to conduct them to the main guard.

If many deserters appear together, the officer will order his party to fall in under arms, and when the deserters arrive at some distance from the picquet he will advance towards them and order them to halt. If they have not been already disarmed he will make them lay down their arms. If they are cavalry he will cause them to dismount. He will then make them file one by one to the right or to the left of the post, and somewhat to the rear of it, to some spot marked out for them, where they must be kept under a sufficient guard.

These precautions will be more or less strictly observed, according to the number of deserters who make their appearance together.

Their arms will be deposited with the picquet, and they will be kept in this situation until the arrival of the orders of the general of the day, to whom the officer of the picquet has sent his report containing all the particulars that he has been able to collect from these deserters, in order that if there is anything of importance the general may cause them to be more fully questioned.

Other Visitors to the Outposts.

The officer of the picquet will take care to examine carefully and personally all individuals, whether travellers or inhabitants of the country, who come from the direction of the enemy. He will inquire whence they come and whither they go, and what is their business in the camp or in its neighbourhood.

He will question them as to their knowledge of the enemy; his situation; what they saw or met with on their journey, and what they may have heard; after which he will either stop them, or let them pass, or send them back to where they came from, according to the orders he may have received on this subject.

Whether he be in a friendly or in a hostile country, he will be equally careful to behave kindly to the country people who bring provisions to the camp; not allowing his people to take anything from them without payment, or to ill-use them in any way; and if he is forbidden to allow them to pass he will send them back civilly, and so as to induce them to answer his questions, by which means he may sometimes learn something of interest.

As there are, however, occasions when the enemy may be expected to try to introduce spies into the camp under pretence of bringing provisions, prudence requires that on such occasions men and women who present themselves in this way shall be stopped and be closely examined. But the officer should not have them searched by the picquet; this is done at head-quarters by order of the general in command, when he thinks it necessary.

Visiting the Sentries.

As soon as the first sentries have been relieved, the officer commanding the picquet will visit the whole of his posts and sentries, for the purpose of questioning them and ascertaining that the new sentries know what they have to do and what they have to watch, and that the countersign has been correctly given to them.*

If the posts and sentries are placed on a height whence the enemy's camp can be overlooked, and what is going on in it be seen with a telescope, the officer will frequently visit the height, so as to ascertain whether the enemy's camp remains quiet and in the same place, and whether troops enter or quit it. If he perceives any change, or any movement whatever, it is his duty to give immediate information to the general in command.

It is especially at daybreak, just before being relieved, that the officer can best ascertain whether any alteration has taken place in the enemy's camp, by comparing what he now sees with what he saw the evening before.

* I believe that the countersign is no longer given in our service. It was found to be of little or no use in the Peninsular War, and the practice was abandoned.—TR.

Retreat of the Enemy.

If during the day the enemy is observed to be preparing to decamp, the officer on picquet will immediately report the circumstance, and will send the same information to the next picquets on his right and left ; and, keeping his party ready to march, he will continue to watch the enemy's movements, so as to follow him the moment he sees that his outposts close up in order to form the rearguard, according to the usual custom.

But in following him up he will be very cautious, and will avoid engaging the enemy until he is supported and receives the order to do so.

Meanwhile he will only follow sufficiently near to ascertain in what direction the enemy has moved, continuing to report all he sees.

With this object he will be satisfied with following without precipitation the progressive retreat of the enemy's outposts, causing the country in his front to be searched for fear of an ambush, and occupying the heights in succession as they are abandoned ; and always continuing to watch the line of the enemy's march.

While following up the enemy the officer will not fail to inform the general in command of the several places and positions which he occupies in succession, and of everything new that he discovers, as it is necessary that the general in command should know where to send his orders. The officer will employ on this duty the orderly dragoons or hussars attached to his picquet.

Use of Cavalry with the Outposts.

This is perhaps the place to observe that although, in an enclosed covered country, the cavalry cannot act with

advantage in the first line, nevertheless its assistance will be of immense use in the outpost duties, whether in rapidly carrying orders and intelligence, or, where the ground admits of it, here and there, by following up the march and the movements of the enemy much more rapidly than the infantry could. It is, therefore, useful and necessary always to attach a certain number of light cavalry to light infantry. Success in war can only be expected in proportion to the excellence of one's information.

In the case under consideration, that of a retrograde movement of the enemy, it may be expected that he has left a number of marksmen or riflemen concealed in the hedges and other coverts. By hurrying on too quickly, one would be exposed to the risk of losing men without much use; the way to dislodge these marksmen is to try to outflank them by penetrating their line somewhere;* fearing then for the safety of their retreat, they will soon quit their cover; and once in motion they cease to be dangerous.

Withdrawal of the Outposts.

If it is our army which decamps during the day, on such occasions there are no particular measures to be taken before the hour of departure, which is always fixed for the outposts by the general in chief.

Until the hour fixed on, everything should remain quiet and in the same situation; and the officer should keep secret the order for departure which, up to the last moment, should be known only to himself.

Shortly before the hour of departure, if there are any

* What our old Peninsular skirmishers used to call "making a point."—T.R.

riflemen with his party, he will make them fall in. If there are no riflemen, he will make use of the best shots among his men.* Supposing there are about a dozen of these, he will divide them into two parties. He will post one of these parties on the right, and the other on the left of his ground. He will place them in rear of his sentries and small posts at certain intervals, and either singly or in twos, and opposite the passes by which he expects the enemy to follow him. He will order them to remain concealed until they have occasion to fire; and then to run in upon the party, to reload, and to take up a fresh position, and so on; paying attention to what goes on on their right and left, and having an eye to their line of retreat, so as not to be cut off by the enemy.

Should the enemy, not perceiving the departure, remain quietly on his own ground, the marksmen will fall back slowly upon the party, and they will have to take up for themselves from time to time such positions as are most favourable for concealment.

The hour of departure having arrived, the officer will order the remainder of his picquet to fall in; at the same moment he will cause all the advanced sentries to be withdrawn by a non-commissioned officer, who will form them into the rearguard of the party, keeping at about two hundred paces nearer the enemy.

The small detached posts will at the same time be

* Our infantry are now all so well instructed in shooting, that this practice of detaching the best shots (which is always inconvenient) may be dispensed with, and the more convenient plan may be adopted of employing the men of a section or a subdivision upon this duty. The telling off of a company is less disturbed in this way.—T.R.

ordered to retire immediately upon the picquet, but keeping at some distance on its flanks, and directing their march so as not to be separated from it by any impassable obstacles, such as woods, marshes, streams, &c. (which might prevent their rejoining the picquet if required), and conforming to its movements, that is, marching when it marches, and halting when it halts; and the officer, who should have made himself acquainted with the ground in rear as well as in front of his post, will take care to give them the necessary orders in this respect.

In case of pursuit the officer in retiring will post, wherever he has the opportunity, small parties in ambush for the support of those first posted, and in such a manner that the enemy in advancing shall be exposed to a constant hidden fire which, obliging him to advance with caution, will enable the retreating army to gain the necessary time for passing through defiles and for making its dispositions.

It is to be observed that in all retreats it is necessary to dispute the roads, particularly those by which artillery and cavalry can move; but it is quite as necessary to dispute the heights, so that the enemy may not be able to discover the direction of the retreat: and with respect to this, it is easier to dispute the roads than the heights. To dispute the roads and to retard the enemy's march, it is sufficient to fell across the road the large trees which are found on the roadside.

Felling Trees on the Retreat.

To effect this object, the officer, having received the order to decamp, will direct an intelligent corporal and

five or six men to fall in behind the picquet, and, taking care to be heard only by this small detachment, he will desire the corporal to collect in the neighbouring farms and villages such men as he can find, each provided with a hatchet, and to proceed quickly with them upon the road pointed out to him. The officer will indicate to him approximately the place where he is to begin his operations, and which will usually be at some distance in rear of the post; he will desire him especially to cut down the trees at the entrance to and along hollow roads.

From what has been said it follows clearly that an infantry picquet should be of much greater strength than a cavalry picquet.

Approach of an Enemy.

If during the day the sentries see a party of the enemy approaching, one of them will, as has been already said, proceed to inform the picquet.*

On receiving this notice the officer will order the picquet under arms, desiring it to remain concealed at its post until further orders. Taking with him a small detachment, he will proceed to the sentry or small post which gave the alarm, in order to reconnoitre the enemy's force and ascertain whether he is in strength, and whether he is advancing direct upon the post or upon some other point. Having ascertained what is going on, he will quickly make his report to the superior officer under whose orders he is, and also, at the same time, to the

* We generally have single "communicating sentries" between the double sentries and the picquet, to avoid the necessity of the sentries leaving their post.—T.R.

general-in-chief (if the matter is sufficiently important), in order that he may be reinforced, or receive further instructions, according to circumstances.

Guarding a River.

It has been said that when there is in front of the chain a river, or stream, or a marsh only passable at certain places, the sentries or vedettes are posted opposite these places of passage, and that they remain there at night.

In such cases the officer will see whether circumstances permit him to erect an abattis or a parapet opposite these places; and instead of double sentries he will place there a small post, which, being thus protected, can dispute the passage longer and give the officer time to come to its support.

He will also most carefully examine whether in front of his post, and between it and the next posts on either hand, there are any other crossing-places besides those pointed out to him by the country people. If he discovers any which have not been shown to him he will place there posts with the same precautions, so that he may not be surprised in the night through ignorance of such passes.

Day Report.

An hour, or sooner, before sunset, according to the distance of the post, the officer of the picquet will send his day report to the general in command. He will send on this duty the non-commissioned officer in command of the orderly dragoons attached to his party; this non-commissioned officer will bring back the orders of the day, and the parole and countersign (if these are given).

The report, for the sake of precision, should be in writing: he will mention in it what he has seen and heard by means of his patrols (if he has sent any out) or from the country people.

Neither the parole nor any order addressed particularly to him should be communicated to any one else. The countersign is given to the sentries at the instant of their mounting sentry, which takes place every two hours, or every hour, according to the weather or the season.

Patrols.

With respect to the patrols that may be sent out beyond the chain during the day in an enclosed country—this presupposes that one is at some distance from the enemy and beyond the probability of their falling in with his outposts. If the object is to collect news and information as to the nearest places occupied by the enemy, this requires separate instructions, which will be found in the section upon “reconnaissances.”*

When one is in sight of the enemy in an enclosed country it must be expected that the patrols cannot advance during the day without being exposed to the fire of the marksmen and sentries concealed in front of the chain. In such cases nothing can be known except by means of posts of observation placed on heights whence a view can be had to some distance; or from deserters, spies, and country people.

Precautions by Night.

In outpost duty the night is the time for vigilance and precaution; these depend upon circumstances.

* Not given in this translation.—Tr.

These circumstances are of various kinds.

Those which depend upon the proximity of the enemy, his distance from the outposts, and whether his position is one of offence or defence. And those which depend upon the nature of the ground.

It may happen that the posts and sentries which are sufficient during the day to observe everything and to give the alarm to the picquets are no longer sufficient to protect it against surprise during the night, when in the darkness the enemy might pass between two posts without being either seen or heard.

It may happen that posts of observation which are well placed on heights for seeing, during the day, whatever might be moving towards the chain, are of no use at night, on account of their being at too great a distance from the picquet or from the road which the enemy might take for the purpose of surprising and attacking it. This must be attended to.

There is also another matter which may cause a change in the arrangements for safety during the night, which is, when the darkness is extreme and a high wind or heavy rain prevents the sentries from hearing whether any body of troops is moving in the neighbourhood.

The duty of the infantry picquets at night consists chiefly of two things.

1. To watch the roads by which the enemy may approach the camp.*
2. To protect themselves.

* In an open country both the roads and the country must be watched during the night. In an enclosed country it is sufficient to watch the roads; in an enclosed country a column may attempt to cross the country during the day, but not during the night.

The officer having early in the day observed what changes may be required at night in the situation of his posts, will notice particularly what may have to be done for the defence of the roads which exist in that portion of the ground entrusted to his safeguard.

He will select on these roads the most suitable places to construct an abattis or barricade, and without loss of time he will set to work on them the country people whom he can collect in the neighbourhood; he will entrust the superintendence of the work to a sergeant or corporal, to whom he will explain how it is to be executed.

At nightfall he will wait till it is dark before he withdraws the posts of observation which are on the heights and the sentries who are to be posted elsewhere.

He will station behind the abattis and barricades, which have been constructed for the defence of the roads, nine or ten men at each place; he will order them, in case of attack, to hold the road as long as they can without running the risk of being cut off; and in order to know when the enemy shall attempt to turn them, they will station a sentry at some distance on either side of the post to listen.

When they are obliged to quit their post they will retire along the hedges bordering the road, keeping the hedge between them and the enemy, and keeping up a constant fire during their retreat, to give notice that they are followed by the enemy. The officer will instruct them to halt from time to time to ascertain if they are really pursued, or if it is only a false alarm.

Precautions against a Night Surprise.

Having thus provided for the defence of the roads which lead to the camp, the officer will turn his attention to the

measures to be taken to prevent the picquet from being surprised during the night.

The new chain of sentries which he will establish on the front and flanks of the picquet should not at night be more than two hundred paces off, being dependent, however, in this respect upon the nature of the ground—that is to say, that there must be sufficient distance between the sentries and the picquet to enable the latter to fall in under arms before being attacked, and yet without spreading the chain much beyond the distance necessary for this object.

The officer will also not neglect to protect his rear; but on the side towards the camp single sentries are sufficient.

In proportion as the night is dark and the weather stormy the sentries must be drawn nearer to each other on the circumference of the chain round the main picquet during the night.

When it is very dark, and the wind or the rain prevents one from hearing the approach of anything coming from the enemy's side, the double sentries will perform the duties of moveable sentries—that is, while one remains steady at his post the other will move to his right till he is near enough to see the first fixed sentry on his right; after which he will return to his post by the same way. On the return of this sentry the one which had remained at the post will in his turn move towards the first fixed sentry on his left. In this way each sentry will alternately act as moveable sentry between his post and that of the next sentries.

The drawing in of the sentries round the picquets during the night and the abandonment of the heights

which were occupied during the day must leave greater or less intervals between two picquets where there are no other fixed posts but those employed in defending the roads to the right and left of the picquet; and it must not be forgotten that as the picquet has been placed by the superior officer of the day who formed the chain, upon the main road which the enemy would take in order to march on the camp at this part of the chain, it might happen that there was no other road to defend in the extent of the post, and that the whole night duty between two picquets has to be done by the lateral patrols.

In such a case the patrols should succeed each other continually; and in cases of uneasiness the return of one patrol should not always be waited for before another is sent out.

The Picquet Guard.

The officer has still to examine how he will dispose his picquet guard.

Suppose the picquet to be placed in a thick wood, or in an isolated farmhouse with a court-yard and garden.

If the post is situated in a wood the outer skirts of which are occupied by his sentries, he will look out for some hollow behind the point he wishes to defend, where he may light a fire without its being seen.

Should no such hollow exist he will have one dug, using the earth excavated to raise a parapet towards the enemy, and by the help of trees and branches, he will contrive to hide the light of his fire from the enemy during the night.

He will take care that the communication between the

place where he makes his fire, at a short distance from his post of defence, and the place where his party is to fall in under arms (alarm post) shall be open and easy; and also that his alarm post shall be clear and void of hollows or shrubs.*

If the picquet is posted in a farm-house or isolated house, it must be determined whether the post of defence is to be outside or inside, including the court-yard and garden.

It is seldom that a house or a court-yard is fit for the post of defence of a picquet. The reason is that the duty of a picquet being to warn, regard must be had more to the safety and facility of its retreat than to its powers of resistance.

But a party shut up in a house or in a court-yard can only get out in sufficient time by the garden. The communication between the house, or the court-yard and the garden, should therefore be very open and easy, and the garden must be situated on the proper side: this cannot always be reckoned upon; when it is the case advantage may be taken of it; but as in most cases the point of defence will be best placed outside, the officer will select a place behind the walls where he may light his fire (without, however, approaching so near as to endanger the buildings), so as to hide it from the enemy.

He must not allow his men to sleep inside the house nor to occupy the rooms.

The daytime will be the most favourable time for allowing those who are not on sentry to sleep.

During the night the officer will keep awake near the

* The alarm post should be in rear of the fire. See Drill Book.
—TR.

fire, half of his men who are not on sentry. In the event of alarm he will keep the whole of his party awake.

If in certain situations the fire cannot be sufficiently hidden from the enemy, the officer will keep in readiness some loose earth or sand, with some shovels, so as to be able to extinguish the fire on the first alarm.

The officer should himself visit his posts and sentries at least once during the night; with so many cares devolving on him, he will have little time for rest. In such trying times he should remember what he owes to his country, and recollect that an officer who allows himself to be surprised can hardly expect to recover his personal reputation.

Repelling an Attack by Night.

If, during the night, the advanced sentries hear any noise, if the noise continues, and sounds like troops marching in the neighbourhood, one of them will advance towards that side with much precaution, and will try to ascertain what it is; and if it is indeed something of the sort he will quietly retrace his steps and warn the picquet.

If, in like manner, during the night, the sentries hear anything approach near enough to hear a challenge, one of them will cry, "Who comes there?" If no answer is returned the sentry will fire.

If the party continues to approach the second sentry will repeat the challenge, and if no answer is returned he will fire.

The two sentries will at once retire upon the picquet.

Half the picquet will immediately occupy the place of

defence, and the other half will fall in under arms at the alarm post.

If the attack begins in front of the post, the sentries round the post who have not been attacked will retire by the flanks of the picquet to such points on the right and left as the officer may have marked off for them. In the event of their being themselves attacked, they will, in like manner, retire upon the points on the flanks of the picquets which have been marked out for them. Before nightfall the officer will make all the men acquainted with these points, so that those who are on sentry on the flanks may examine the way to them, so as to be able to obey the order.

The officer will tell off two corporals or non-commissioned officers, who, in case of attack, will immediately occupy the places which have been pointed out on the flanks of the post. This measure is of the greatest consequence, and the attention of the officer during the attack must be turned particularly in this direction.

The reason is, that the enemy coming directly in front, and finding the post on the alert and in a defensive attitude, and perhaps supposing it to be entrenched, may content himself with keeping up a fire in front without advancing in that direction; but during this fire he may try to rush in on the flanks in order to take the post in rear and cut off its retreat.

It is to prevent this manœuvre that there should be detachments on the flanks to warn the officers of such an attempt.

So long as the fire is only in front he may continue to defend himself; but the moment he hears that his flanks are attacked, he will order his men to give up the defence

and to pass to the rear, covered by the party which is under arms at the alarm post.

Those who have given up the defence will take up a position at about 100 or 150 paces in rear of the alarm post, on a spot chosen during the day, and noted by all the officers and non-commissioned officers under the orders of the commanding officer. This spot should be chosen on the direct line of retreat.

The officer in command, who hitherto will have replied to the enemy's fire from his alarm post, will fall back in his turn when he judges that the post in rear has been properly occupied and the arms loaded,* and thus in succession from post to post his party remaining divided into two parts, which mutually fall back upon each other, taking care to select their rallying posts in convenient places and especially at the head of each defile.†

The detachments on the flanks will conform to the retreat, paying attention to the progress of the fire, and trying to keep on a level with the main body.

On his part the officer in command will not lose sight of the march of his flank detachments. According as he sees they are hard pressed or losing ground, he will either hasten his retreat or hold fast, to keep as much as possible on a level with his detachments. He will act in this manner until he receives reinforcements or reaches the

* The whole party will not retire together ; eight or ten men will remain in position and form a rearguard, which will follow at about fifty paces.

† In order to let the flank detachments pass, if these have to move through the same defiles. It may happen, too, that the pass is of such a nature that it may be defended till the arrival of such help as may be expected.

camp. Nothing is more honourable to an officer than a retreat conducted in good order and well adapted to the circumstances of the case.

Knowledge of the Ground essential.

But it is easily seen that so many details cannot be undertaken with success without a perfect knowledge of the ground over which one has to operate.

The officer in command when going to occupy the post marked out for his picquet, must have come from the camp pretty nearly by the way by which he will have to retire. During the march he will have the opportunity of observing the nature of the country, the situation of houses, woods; the meeting of roads and the names of the places to which they lead; he will, if he is able, make a sketch of this in his note book, or at least a written itinerary, in order to remember them.

A knowledge of ground being so essentially necessary to an officer of light troops, he should make it a rule never to pass by ground in the theatre of war which is unknown to him, without making such notes of it as circumstances permit, either by a sketch or in writing. During the course of a campaign he will often find that this trouble has not been in vain.

Reception of Detachments returning to Camp.

If, in the night, some party which has been detached from the camp approaches the chain of outposts, it should be stopped by the sentries at fifty paces off, although it may have the parole or countersign; and one of the sentries will go and warn the picquet.

46 RECEPTION OF DETACHMENTS RETURNING TO CAMP.

The officer of the picquet will order his men under arms, and will immediately send a non-commissioned officer and some men to conduct to the picquet the commander of the detachment, ordering the detachment to remain where it is, beyond the chain, until further orders.

The officer of the detachment having been conducted to the picquet, will be carefully examined by the officer of the picquet upon all matters by which he may be recognised, unless, indeed, he is personally known to him. The officer of the picquet will then desire the non-commissioned officer who has conducted the officer of the detachment to the picquet to return to the detachment, which will have remained, in the mean time, beyond the chain, and to cause the men to pass one by one towards the camp by the flanks of the picquet, the non-commissioned officer showing them the way and conducting them on the road which they must follow to return to camp, as far as the place where the detachment is to halt to await the return of its commander, who till then has been detained by the officer of the picquet, who will not allow him to rejoin his detachment till he has received the report of the non-commissioned officer who was ordered to pass on the detachment.

It may happen that the detachment which is returning has been absent for several days, and consequently is not provided with the countersign. In this case, the examination by the officer of the picquet must be more strict. But if in this examination he discovers no motive for suspicion, he will allow the detachment to proceed towards the camp, observing all the precautions which have been laid down in this respect.

If during the examination any cause of suspicion should arise, the officer of the picquet will cause the detachment to file, as has been said, in rear of the picquet, in which situation he will cause it to be watched in front by some men : he will retain the officer with him, and will not allow him to depart for the camp till after daybreak.

Reception of Deserters by Night.

If deserters present themselves in considerable numbers during the night, they should be stopped at the outposts and disarmed, as in the daytime ; the officer will keep them at some distance behind his post under the charge of a few men ; he will cause them to be brought to him one by one, and will question them separately ; and if he learns from them anything of importance he will immediately acquaint the general-in-chief.*

Departure of the Army in the Night.

It often happens that an army decamps silently during the night, without beat of drum or sound of trumpet ; this is called "stealing a march."

* If any man of the picquet deserts during the night, the officer will instantly change the parole and countersign,¹ and will immediately communicate the new countersign to each of his posts and sentries ; as the enemy may make use of the deserter and attempt to surprise the post, the officer will become doubly vigilant ; he will send out his lateral patrols more frequently, and will keep all his men on the alert. He will notify the desertion to the picquets on each side of him, and will give them the new countersign, so that during the night the respective patrols and sentries may be on their guard.

¹ Supposing such to exist.—Ta.

Whatever may be the reason for thus silently decamping, it is always sought to conceal it from the enemy; and with this object the picquets are left on the ground till daylight.

On such occasions the picquets must be kept on the alert, seeing that if the departure of the army is discovered by the enemy, the picquets must expect to be immediately attacked.

The lateral patrols should be constant, and so frequent, that there shall be always several on foot at the same time, so as to prevent spies and deserters from breaking through and informing the enemy of what is going on, and also to prevent his patrols from approaching near enough to find it out for themselves.

Exceptions to the rule of withdrawing Posts of Observation at night.

It has been said elsewhere that during the night the posts of observation should be withdrawn from the heights; but there are certain exceptions to be made in this respect.

If in the extent of the line of outposts there is any height or other place whence our camp can be overlooked, it has been said that this height or place should be occupied during the day: it must also be occupied during the night. At night the post may even be reinforced if necessary; and the officer will take measures to protect it by some obstacle so as to enable it better to hinder the enemy from coming there for the purpose of observing the movements of our army.

Again, if there be in this portion of the chain any height whence the enemy's camp might be observed, a

post of observation must also be kept there during the night. The officer will desire this post immediately to report to him any change which is observed in the enemy's bivouac fires during the night: he will do well to visit this post himself from time to time, so as to make sure that there is nothing going on in the enemy's camp which should be reported.

Signs of the Enemy's Retreat.

If the fires should become dim and begin to go out sooner than usual, some movement of the enemy may be presumed. If the fires are much larger and more brilliant than usual, it may be presumed that he has decamped, because it often happens that the servants and women and other camp followers set fire to the straw in the camp, and to the suttlers' huts, either by accident or purposely, and then the fire spreads to every part of the camp.

It is the business of those who decamp during the night to take the necessary measures to provide against this, and also to prevent the enemy from discovering the departure of the army by the fires going out sooner than usual; it is therefore customary to leave small detachments of infantry for the purpose of keeping up the fires of the camp guards along the whole front till near daybreak. As everything that ought to be done is not always done, the officers of the picquet should look to all these matters.

Noises at Night.

Sometimes the two camps are so near to each other that the picquets to leeward can, by listening in the silence of the night, hear the noise of the departure or the arrival

of troops, either by the clashing of arms, the murmur of voices, or the cracking of the artillery drivers' whips.*

All unusual noises at night disclose something. If the noise continues, but diminishes, it is a sign that the enemy is quitting his camp either in whole or in part. If the noise, after it has begun, increases and then suddenly ceases, it is a sign that fresh troops have arrived in camp. If blows are heard as of driving picquets into the ground, it may be presumed that the enemy is constructing a battery or an entrenchment in the neighbourhood.

All these things should be observed at night by the officers of the picquets, and each of them should make their report to the general-in-chief as soon as they become aware of them.

Retreat of the Picquets in the Night.

If an army decamps silently during the night, whether to take up a position in rear, or to gain an important point by stealing a march upon the enemy, it is usual, as has been said, to leave the picquets in position till day-break. They must in such cases be doubly vigilant, and keep their lateral patrols constantly on the move.†

Among the precautions to be taken for the night, it has been said that the officer should select a place in rear of his post and at some distance from his alarm post, in order to take up his position there in the event of being attacked and obliged to retreat.

* This was written in the days when artillery was driven by waggoners with long whips.—Tr.

† This and the next few paragraphs appear to be almost a repetition of what was said at page 42, and following.—Tr.

In the case under consideration he will make use of this place; and at daybreak, if the enemy discovers the retreat of the army, he will abandon his alarm post and occupy this second position. At the same time he will have his detached posts and his sentries relieved by a non-commissioned officer, who will form them into a rearguard, and will take up a position at the alarm post that the officer has just quitted.

As to his detached posts, they will retire upon his flanks or upon the rearguard, according to their situation. In one way or other he will take care to cover each of his flanks by a detachment, before commencing his retreat, and he will order these detachments to watch his march and his movements, and to preserve, as far as possible, their place and distance with respect to him.

The officer will not begin his retreat till he has heard from the commander of his rearguard that each and every one under his orders has joined his respective post.

Before relieving his sentries he will post in every favourable place in front of his rearguard all the riflemen who belong to his party.

It is upon the rearguard that these riflemen will have to fall back as soon as they have delivered their fire.

As they reload they will take up fresh positions in all favourable places between the rearguard and the enemy; that is to say, the riflemen will form the rearguard of the rearguard.

The flank detachment should be similarly covered by riflemen acting in the same way.

Failing riflemen, the officer will select the smartest men and best shots of his party for this duty.*

* See note, page 32.—TR.

Riflemen (or sharpshooters) are particularly useful in retreats when thus posted : they await the enemy's approach. When they are forced to move on and to fire in the open they lose their advantage.

But whether one has riflemen or not, a retreat should always be covered by skirmishers posted here and there : when the measures are well taken, and the men are practised in this duty, it will be found in practice that riflemen may be dispensed with.

The officer will determine the moment of retreating, according to the general movements of the army, and according as he is more or less pressed by the enemy. One of his principal cares will be to conform to what is going on on his right and left, keeping abreast of the neighbouring picquets, whose position he may ascertain by sight or by the smoke or the noise of their fire ; for it would be very odd if an army in front of an enemy could decamp without being partially or wholly followed.

While retiring the officer will constantly watch how he is followed : if he can halt upon a height, he will observe what is the enemy's strength ; whether it consists of cavalry or infantry ; if the enemy is coming against him, or if a column is moving in another direction ; in order that he may immediately report the circumstance to the general officer in command of the rearguard of the army.

If a bridge or any other defile occurs on the road he is following, the officer will take care to halt at a hundred and fifty or two hundred paces on the other side of the defile, and will draw up his party in an arc, with its concavity towards the defile, so as to cross and concentrate his fire upon the outlet.

His rearguard on quitting the defile will re-form, under

this protection, at fifty or sixty paces behind him, and the marksmen will post themselves as the nature of the ground permits.

That done, he will leave a small portion of the centre of his party in position at the same place, to follow him at about a hundred paces, and thus protect his retreat; with the remainder he will take up a new position at about three hundred paces beyond the place occupied by his rear-guard, and he will continue his march with the same care and precaution, both as regards his own party and the general movement of the army.

From what has been said of the duties of light infantry in a retreat, it is apparent that, to perform this service properly, troops should be practised in making sham retreats. It is not at the moment of action that an officer can instruct his people in so many details, some of which, having to be performed individually, presuppose that the individuals are accustomed to them.

Posting a Picquet by Night.

Sometimes the army reaches its camp so late that night falls before the picquets have been placed.

At other times it may happen that a picquet receives during the night the order to move further to the front towards a certain place or a certain village.

When the places that the officer is to occupy are unknown to him, the precautions to be taken are greater in proportion to his ignorance of the details of the situation he is to occupy. In this dilemma his first resource must be in his map, to which he must not fail to add the information which he has obtained from the people of the country.

In the case of having to change his position, he must first procure a guide from the neighbouring houses, and a light by which he may study his map. By questioning the guide about the nature of the roads and the places to which they lead, he will be able to judge whether the guide knows the ground, and whether he is leading them correctly or not: if there is any doubt upon this point, a better-informed guide must be obtained.

On reaching the post which is to be occupied, a light and some of the neighbouring country people must again be obtained and be questioned about the villages, roads, woods, and rivulets, which are in the direction of the enemy; and accompanied by them the officer will make them show him all the roads about which he has inquired, so that he may place the posts and sentries accordingly.

The officer will fix his alarm post on the principal road which he has to defend, and according to local circumstances.

The place indicated to him may be a single house, the entrance of a village, or of a wood, a pass or defile of any kind, or a mere hill.

In the first moments he can hardly think of artificial obstacles: he must only seek to post his sentries properly, without leaving unwatched any road by which he may be approached. It will suffice to occupy the place appointed for him as a night post; but having lost his connection with the neighbouring posts, he will take the same precautions with respect to his flanks and his rear as to his front: he will order his double sentries to visit each other alternately to the right and left, so that nothing may pass without their knowing it. He will keep all his party on the alert during the remainder of the night; in case of

attack he will behave as has been before said; and in order to be warned of anything which may come upon his rear, he will have the road by which he came constantly patrolled, so as to direct his retreat with greater safety.

Re-establishing the Day Picquets.

At daylight the officer will make a regular reconnaissance of the ground he has to guard, observing the rules which have been already laid down with respect to the arrangements for the day-time.

If the picquet has not changed its place, and the night has been quiet, all the arrangements (with respect to the posts of observation, and of warning, and other matters of detail) which were made on the day of arrival, and which may have been upset by the night arrangements should be re-established at daybreak.

A little before daylight the officer will get all his men under arms: this precaution is necessary until the ground in front has been examined and searched. If the enemy has formed any design it is generally about this time that the picquets are attacked.

In re-establishing his day posts the officer will observe the following precautions.

He will advance with one-half or one-third of his men, according to his strength and the nature of the ground, till he is abreast of his night sentries; he will cause them to be called in; he will form them into four, five, or six patrols of two men each, which he will distribute on his front and flanks at two hundred paces distance. He will order them to search and examine closely the bottom of hollow roads, of ditches, the off side of the hedges, the woods, and other coverts which might conceal an enemy.

He will support these skirmishers by two or three small parties of five or six men each at two hundred paces in rear: with the remainder of his party he will follow slowly, keeping two hundred or three hundred paces further in rear, and paying attention to the manner in which the ground is searched by his skirmishers.*

If it is foggy he will leave smaller intervals between his several parties. In this case the rule is that the skirmishers should see each other, that the supports should see the skirmishers, and that the reserve should see the supports.

Having thus satisfied himself that in the whole extent of his ground the enemy has not laid any ambush for him during the night, he will occupy with his detached posts and his sentries all the positions that they occupied the evening before.

If the fog lasts and prevents them from seeing the country, the sentries will visit each other alternately, as at night; and if the intervals are too great (as may be the case with day posts) he will order constant lateral patrols so as to remedy this defect.

Relieving the Picquets.

The general custom is for the new picquets to proceed at daylight to the support of those that they are to relieve on the chain of outposts, because it is, as has been said, about this time of day that the outposts are attacked when the enemy has formed any design.

As it has sometimes happened that a picquet has been carried off in silence during the night, from having neglected some necessary precaution, the new picquet should approach

* This is simply our plan of skirmishers, supports, and reserves.
—Tr.

softly and with precaution, and should halt at four hundred paces or thereabouts from the post it is about to relieve; the small advanced guard which should precede it will advance, feeling the ground, as far as the first sentry. This examination of the ground being made, the new picquet will advance as far as the sentry, where it will halt till it has, in its turn, been reconnoitred by the old picquet, which will stand to its arms if it has not already done so; and the two picquets will pay each other the usual honours;* the new picquet placing itself on the left of the old, fronting towards the enemy.

The officer of the old picquet will then give the relieving officer every information respecting the post; subsequently the same number of detached posts and sentries will be furnished by the new picquet.

The officer and a non-commissioned officer of the new picquet, accompanied and guided by a non-commissioned officer of the old picquet, will proceed to relieve the old sentries and posts, and they will receive from the non-commissioned officer of the old picquet every information respecting the situation of each post.

The old picquet will remain on the ground till all the posts and sentries have been relieved and all its patrols have come in, after which, every information having been given, the old picquet will march off and proceed in good order to the camp.†

If in some places the ground had permitted the employ-

* With us outposts pay no honours, standing only to their arms when approached by armed parties, or by a general officer, or the field officer of the day.—Tr.

† Should the new picquet be attacked before the old picquet has reached the camp, the latter will immediately face about and go to the support of the new picquet.

ment of a cavalry picquet, and that this cavalry picquet takes post at night behind the infantry picquet, as is often the case, the cavalry officer must select, in rear of the infantry picquet, the place which suits him best, and must take his own measures for his own safety.

But both officers will consult together for the patrol duties, both as to the time for sending them out and the road they are to take, so that they may be forewarned in case they meet each other.

Concluding Observations.

In conclusion, it must be observed that written instruction is but an alphabet to be used in forming words. It is on the actual ground, in the inclemency of seasons, and in front of a subtle, active enemy, that one must learn to shape one's ideas. No one can pretend to give a complete and finished detail of everything which may happen in war, and to note all the various circumstances which may occur in every possible situation.

An officer must not think that he has provided for everything because he has acted up to some part of these instructions. It is by studying the nature of the ground, and by the examination and application of the actual circumstances, with reference to the presence and the attitude of the enemy, that an officer will discover, by using his own powers of reflection, the way in which he should behave on every occasion.

NOTICE.

THE original object of this compilation was to place in the hands of the students of the Staff College a short and concise account of the several kinds of military reconnaissances which staff officers are called upon to make in the field, and of the manner of executing them.

I am not aware of any work in the English language which treats fully of "Reconnaissance," though there are several valuable articles upon the subject to be found in such publications as the "Aide Mémoire to the Military Sciences," "Macaulay's Field Fortification," "Jervis's Field Operations," "Instructions for the Officers of the Quartermaster-General's Department," and "Jackson's," and other books upon surveying. But these articles do not sufficiently enter into the subject in all its various details. On the other hand, the French possess many important works upon "Reconnaissance," in which the matter is treated in a very full and comprehensive manner; too much so, perhaps, for the general reader. Moreover, some of these works must be admitted to contain a good deal of matter which is not necessary for the object in view—namely, to enable a staff or other officer to perform in a creditable manner the various reconnaissances which he may be called upon to execute during a campaign.

It therefore seemed advisable to extract from the above-mentioned sources so much as appeared to be applicable to the requirements of the British staff officer, and to adapt these extracts to the course of instruction in this subject which is followed at the Staff College; and as regimental officers even are often called upon to make reconnaissances and reports upon positions, roads, and rivers, I have thought it not altogether out of place to add this chapter to my translation of General Jarry's work on outposts.

For the benefit of those who wish to study the subject more thoroughly, a list is given of the French authors from whom the materials of this compilation have been chiefly drawn, and from the study of whose works much instruction will be derived.

LIST OF FRENCH AUTHORS CONSULTED.

- "Essai sur les Reconnaissances Militaires," par Monsieur A. Allent.
- "Traité des Reconnaissances Militaires," par Monsieur A. Chatelain.
- "Recueil sur les Reconnaissances Militaires," par Monsieur J. Corréard.
- "Théorie générale des Reconnaissances Militaires," par Victor-Séverin Sobieski de Janina.

There are also some excellent German works on this subject.

CONTENTS.

SECTION I.

PRELIMINARY OBSERVATIONS.

	PAGE
Two kinds of reconnaissances.	
1st. Reconnoitring the enemy.	
2nd. Topographical or Special Reconnaissances of ground.— Their object.	
Importance of Reconnaissances.—French system .	67—70

SECTION II.

TOPOGRAPHICAL OR SPECIAL RECONNAISSANCES OF GROUND.

Qualifications for reconnoitring :—

- 1st. *Sketching Ground*.—Military science also necessary.—
Chatelain's opinion.
- 2nd. *Judging Distances*.—Paces of a horse—of a man.—
Distance measured by time—by sound.
- 3rd. *Languages*.
- 4th. *Fortification*.
- 5th. "*The coup d'œil*."

Sketching without instruments.

Other branches of knowledge included in Reconnaissance.— Conventional signs used in sketching ground.—The report	71—78
--	-------

SECTION III.

RECONNAISSANCE OF A POSITION.

PAGE

Positions are either defensive or offensive.—Conditions of a good position.—Defective positions.—The manner of reconnoitring a position.—Extent of ground occupied by troops.—Manner of occupying a position.—Depth of a position.—Distribution of the three arms, Infantry, Cavalry, Artillery.—Infantry line for defence.—Line for attack.—Position of cavalry in the line.—Obstacles

The Outposts.—Their object.—Their distance from the main body.—Their composition and strength.—Their disposition.—General principle in placing outposts.—Night posts.—Artificially strengthening the position.—Importance of villages, houses, farms, in a position.—Barricading roads and destroying bridges.—Communications in rear of a position.—The key of a position.—The sketch.—The report . . . 79—91

SECTION IV.

RECONNAISSANCE OF GROUND SUITABLE FOR A CAMP.

Its selection.—Its protection.—Supplies.—Manner of encamping troops.—Space required for the camp of a battalion of infantry, a regiment of cavalry, a battery of artillery.—Intervals between battalions.—Position of head quarters and non-combatant corps.—Camps in time of peace . . . 92—95

SECTION V.

RECONNAISSANCE OF A ROAD.

Object of the reconnaissance.—Points to be noted.—Distances to be given in hours as well as in miles.—Accommodation for troops.—Form of road report.

Railways.—Points to be noted 96—101

SECTION VI.

RECONNAISSANCE OF A RIVER.

PAGE

Points to be noted :—

1. Breadth.—Current.—Overflowings.
2. Fords.
3. The banks.
4. The bridges.
5. Places for constructing bridges.
6. Boats.
7. Country on each bank.—Military positions.—Towns and villages.
8. The extent to which the river freezes in winter.—Occasional shallowness and drying up.

Canals.

Note on the mode of ascertaining the swiftness of a stream.

Velocity of rivers 102—109

SECTION VII.

RECONNAISSANCE OF A FOREST.

Points to be observed.

The map or sketch 110—111

SECTION VIII.

RECONNAISSANCE OF A DISTRICT.

Heads of reconnaissance.—The map.—Details of report.

1. Features of the ground.—Watershed.—General course of streams.—Geological structure.—Slopes of hills.
2. Roads, railroads, woods, defiles.
3. Rivers, canals, lakes, marshes, sea coasts.
4. Towns, villages, farms, &c.
5. Produce and supplies, calculation of them.
6. Rural population.
7. Transport.
8. Military considerations.—Positions.—Camps.

Way to acquire information.

Tabular form 112—121

SECTION IX.

RECONNOITRING THE ENEMY.

Difficulty of this kind of reconnaissance.

PAGE

Reconnaissance of a Position previous to attacking it.—Conduct of an offensive reconnaissance.

Offensive Reconnaissance of a Fortified Post.—Information to be gained respecting it, from spies, deserters, and others.—Objects to be particularly noticed in the Reconnaissance.

Offensive Reconnaissance of a Fortified Village.—Preliminary information to be acquired from maps, spies, deserters, prisoners.—Mode of making the reconnaissance by night.—The report.

Armed Reconnaissances.—Mode of conducting them.—Duties of staff officers in such reconnaissances . . . 122—135

APPENDIX.

Note (A.)	136
Note (B.)	139
Memorandum on Topography for the Military Colleges . . .	142

MILITARY RECONNAISSANCE.

SECTION I.

PRELIMINARY OBSERVATIONS.

“MILITARY reconnaissance,” or the examination of ground with a view to conducting military operations, is a subject of great importance in war. Knowledge of the country may, indeed, be considered as the basis of the duties of the quartermaster-general's department on a campaign. Every officer of that department, at least, if not every staff officer, should therefore be able to reconnoitre a country.

Reconnaissances are of two kinds.

1st. Reconnoitring the enemy.

2nd. “Topographical” or “special reconnaissances of ground.”

An enemy may be reconnoitred either secretly, or openly by force.

In the first case the reconnaissance is executed by an officer, either alone or accompanied by a small escort; he endeavours to approach the enemy's position as near as he can, and to ascertain his strength and his intentions.

In the second case the reconnaissance is conducted by a general officer, who at the head of a considerable force, marches openly towards the enemy, drives in his outposts, and forces him to discover his position and his line of battle. Such reconnaissances are called "armed reconnaissances" or "reconnaisances in force." They often lead to collisions, sometimes even to general actions.

"Special reconnaissances of ground" are undertaken by staff officers for the purpose of obtaining information for the general in command relative to the country in which he is operating, and which it is absolutely necessary that he should be in possession of for the proper combination of his movements.

No operation in war can be safely conducted unless the officer in command is acquainted (either personally or by means of information supplied by others) with the country in which he is acting. All the operations of war depend, mainly, upon a knowledge of ground; and as the commander of an army in the field is obviously unable to examine the country minutely for himself, he employs his staff to do so for him.

For example: A commander must often make his movements conformable, or even subordinate, to the nature of the ground and to the obstacles it presents to the march of his troops. An intimate knowledge of the ground is therefore indispensable to him, and, if not already possessed, it must be acquired by means of a reconnaissance.

Or he may wish to know in detail a portion of a river on the banks of which he intends to operate. He orders it to be reconnoitred.

Or he may have to attack an enemy's position; a

previous knowledge of the strength of that position, and the way in which it is occupied will obviously enable him to arrange his plan of attack with the best chance of success. A reconnaissance of the position is therefore ordered.

Again; he may wish either to seize, or to defend, the passes over a range of mountains. He must ascertain the number, the nature, and the state of repair of the roads leading to those passes; the distances to them—whether the communication between the passes is easy or difficult. He must ascertain the extent of the range of mountains, their general character and steepness, and whether the defiles are easy or difficult of access. A good reconnaissance will clear up all that is doubtful or unknown upon these points, and will enable the general to make his arrangements without any fear of mistake so far as his knowledge of the ground is concerned.

Or; an army may be about to march in a direction in which the nature of the country is not well known. The general in command orders a reconnaissance to be made of the several roads by which his columns are to move.*

Or; an army has to march through an extensive wood or forest. It is necessary to reconnoitre the wood before venturing into it.

In the same way railroads, canals, fortified posts, and districts of country, must be reconnoitred and reported upon.

Importance of Reconnaissances.

The importance of reconnaissances can hardly be over-estimated, for, upon their accuracy, the fate of a battle,

* Chatelain.

or even of a campaign, may depend. So fully aware are the French of this, that with them the practice of reconnaissances is not confined to the military colleges and staff, but an opportunity of making reconnaissances, and thus bringing themselves to the notice of their military chiefs, is afforded, at the periodical inspections of regiments, to all officers of every branch of the service who choose to avail themselves of it.

A French writer observes: "Officers of all arms should be taught to appreciate a position, a road, an obstacle, so as to enable them to perform in an efficient manner the duties of outposts, of flanking parties, and of detachments. A general assisted by officers who are in the habit of making reconnaissances, may, when opposed to a general who is not so assisted, be likened, not inaptly, to a long-sighted man opposed to a blind man."

The manner of executing these several "special reconnaissances" will now be considered, leaving aside for the present the consideration of "armed reconnaissances."

SECTION II.

TOPOGRAPHICAL RECONNAISSANCES.

EVERY topographical reconnaissance consists of two parts :—

1. The sketch of the ground.
2. The written report.

Both are essential to a clear understanding of the object reconnoitred.

A sketch imparts a far better idea of the ground than can be conveyed by any written description, however clear and concise ; while, on the other hand, a written report may contain a mass of valuable information which could not, by any possibility, be put into a sketch.

The one is, therefore, the complement of the other ; and no reconnaissance can be complete which does not consist of both.*

* Nevertheless a reconnaissance may be very valuable, though it consist merely of a verbal report without any plan or sketch. Want of time, the presence of the enemy, or other circumstances, may prevent an officer from doing more than making a rapid examination of the object he is ordered to reconnoitre. He is not on that account to imagine that his observations may not be very important.

The object of this treatise is to teach how "reconnaissances" should be conducted when time and all other circumstances are favourable. In actual practice in the field we must often be satisfied with much less.

Hence an officer who undertakes to make a reconnaissance should possess the following qualifications :

Qualifications for Reconnoitring.

First. He must be able to sketch ground ; for although he is not required to make a regular survey of the whole country that he is ordered to reconnoitre, he must be so far acquainted with military sketching as to be capable of making a plan of any position he may meet with, or of any particular portion of the district that he is reconnoitring.

A certain facility in sketching ground is therefore indispensable. But it must be observed that a knowledge of topography alone will not enable an officer to make a valuable reconnaissance. He should also possess some military knowledge and experience, to enable him to determine what ground is best suited for each arm, and to judge correctly of the obstacles or the facilities which a country offers to the movements of an army.

A French writer (Monsieur Chatelain) observes upon this point : " The number of military men who are capable of executing a military reconnaissance of a country of any extent is small. The reason is that this operation requires not only topographical knowledge, but an equal knowledge of the art of war ; and it is well also to have seen in the field troops of all arms, march, take up a position, and fight. If the officer who is charged with the reconnaissance of a country has no knowledge of war, he will either enter too much into all the details of the ground, for fear of overlooking some essential points, and will thus make his work unnecessarily long

and minute, and rather tiresome than useful ; or he will neglect the details altogether, and thus produce an incomplete work. In short, if he does not appreciate the ground correctly (which is very probable), his work will be useless ; while, on the contrary, the officer who adds to his knowledge of topography some acquaintance with the art of war, will dwell upon the several parts of the ground according to their bearing upon the line of march, or the field of battle ; and he will add to his report such observations as may be useful to the general.”*

Secondly. He should be able to judge distances correctly by the eye. This power is most useful to the reconnoitring officer, and may be acquired by comparing known distances with estimated unknown distances, and then measuring the latter. But not only must he be able to judge distances by the eye and to pace them correctly, he must also be able to measure them by the paces of his horse, because there are occasions when a reconnaissance can only be made rapidly on horseback. As the paces of horses differ, it is of no use to lay down any particular measure for a horse's paces. Every staff officer should ascertain those of his own animal at the walk, the trot, and the gallop.

In like manner the length of pace of men differs. Some military sketchers pace a yard,† others use the military

* This opinion of Mons. Chatelain appears exaggerated ; still it will hardly be denied that the officer who from experience in war is able to appreciate ground correctly will possess an immense advantage in reconnoitring.

† On rough or steep ground it is very difficult to pace a yard. It may be done on level ground for short distances, but hardly for a whole day.

pace of thirty inches. Every field sketcher should ascertain the pace that comes most naturally to him and should adhere to it; but he must always reduce his *paces* to *yards* in laying down his work on the sketch, or, at any rate, give a scale of yards.

Sometimes in a reconnaissance, particularly in that of a road, distances are measured by the time taken to perform them, either on foot or on horseback.

Distances may even be measured by sound. If the flash or the smoke of a gun be seen, and a few seconds afterwards the report is heard, the number of seconds multiplied by 370 yards (the rate at which sound travels per second) will give the distance.

Thirdly. A knowledge of the language of the country to be reconnoitred is most useful to the officer employed on this duty, because in every reconnaissance much of the information required must necessarily be obtained from the inhabitants. An officer who is not acquainted with the language of the country is, at the best, in the hands of an interpreter, if he is fortunate enough to find one; but if he can speak the language, and is acquainted with the history of the country, and, above all, if he respects the customs and the religion of the inhabitants, they soon cease to regard him as a stranger, and may even become communicative. Care should be taken to learn the local pronunciation of towns and villages. The peasantry are generally dull, and unless these names are pronounced exactly as they pronounce them (very often quite unlike the way in which they are written) they will not understand what is meant.

Fourthly. Some knowledge of fortification is also necessary, both to enable an officer correctly to describe and

sketch a fortress or field works which he may be ordered to reconnoitre, and enable him to judge of the best position for, and the trace of, any works which he may recommend for the purpose of strengthening a position which he has been ordered to report upon.

Fifthly. The habit of observing ground with reference to military operations is most useful. This power of seizing at once the capabilities of ground, and which is called the military "coup-d'œil," is a natural gift. But it may be acquired to a certain extent by accustoming one's-self in one's daily walks and rides to examine the country with the eye of a soldier, observing the positions it affords, and considering the means of attacking or defending them, estimating the number of troops required for their occupation, noting the places best suited for camps, the nature and direction of the roads, the rivers, the swiftness of the current, the nature of the banks, the bridges and fords, and other details. In this way the eye becomes accustomed to judge and to observe.

Sketching without Instruments.

Such are some of the qualities absolutely necessary to enable an officer to become a good reconnoitrer; but it must be observed that it is not sufficient that he shall be able to sketch ground when he is provided with instruments, and has plenty of leisure; he must also be able to do so without instruments and in the most rapid manner, either on foot or on horseback; for in war, reconnaissances must often be made in presence of the enemy, sometimes even under his fire. In such cases there is no time for accurate measurements or deliberate drawing. Everything must be done rapidly; the salient and important

points must be seized—the unimportant disregarded. Rapidity in sketching is of the greatest importance in the field. An officer employed upon this service will constantly find himself *working against time*. A sketch of a position, or a river, or a road, is generally required for a specific object, which object will have passed away before the sketch is sent in if much time is spent upon it. The reconnoitrer must therefore learn to distinguish between what is necessary for military purposes and what is unnecessary; and, discarding the latter, must confine himself to the former.

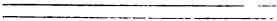
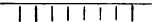
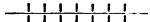
At the same time a sketch should be accurate, without being minute: minuteness of detail is not required in a military sketch—but general accuracy in the main features is necessary; and when time or other circumstances do not permit of this, the fact should be stated; as nothing can be more fatal than to mislead a general by incorrect information.

Conventional Signs.

The following rules and conventional signs should be observed in the preparation of military sketches:—

1. Every sketch or plan should be clear, precise, and easy to read.
2. Every sketch should have a scale and a north point.
3. Hills should be clearly expressed either in the horizontal or vertical style, or in brush work.*
4. Woods should be coloured with a flat shade of green, the boundaries should be clearly indicated, and the description of wood specified.

* The rules for hill shading as established at the military colleges will be found in the Appendix.

5. Gentlemen's parks—also by a flat tint of green of a lighter colour; with a few trees dotted about.
6. Cultivated ground should be marked by the word "cultivation" written across it.
7. Buildings of stone or brick should be coloured red.
8. Buildings of wood should be coloured black.
9. Bridges—either red or black, according to their material.
10. Streams and all water—blue.
11. Fords—to be dotted across the streams:
12. Roads—high roads and metalled roads—coloured brown.
 If fenced—indicated thus 
 If not fenced—indicated thus 
13. Byeroads are left uncoloured.
 Railroads, thus  or thus 
14. Troops—thus, Infantry, ; Cavalry, ; Artillery, . British troops to be coloured red.
15. References of a local character will occur in compiling plans.
 They should be written thus— *References.*
 Titles of plans, thus— . . **SURVEY.**
 Names of districts, thus— . . **YATELY.**
 Towns, thus— . . . **Farnham.**
 Villages, houses, farms, &c., thus *Frimley.*
 Letters and figures referring to the reports which accompany the sketch . . . **A. B. C. I. IV.**

The Report.

The report which accompanies the sketch should be written on paper with half margin, and with headings in the margin. It should be drawn up in accordance with the instructions issued for the execution of the reconnaissance, and these instructions should be appended to it. The language should be clear and concise, and all unnecessary or irrelevant matter should be avoided. Above all, the writing should be very legible, and all names of places should be correctly given.

In describing ground, particularly a position, it is better to make use of the terms north, south, &c., than of the terms right, left, which are apt to mislead a general, who often is at a loss to know whether the enemy's "right" or his own is intended. This observation does not apply to a river, whose banks should always be described as "right" or "left," because in a river which winds much each bank may sometimes be to the north and sometimes to the south.

The notes from which the report is framed should be taken on the ground during the actual execution of the reconnaissance, and care should be had to distinguish between the information which has been derived from others and that which is the result of one's own observation.

The application of the subject will now be considered under the following heads:—

1. The reconnaissance of a Military position.
2. " of a Camping ground.
3. " of a Road.
4. " of a River.
5. " of a Forest.
6. " of a District of country.

SECTION III.

RECONNAISSANCE OF A POSITION.

THE art of selecting and occupying a military position belongs rather to the higher branches of tactics than to reconnaissance, and is more the province of the commander than that of the staff officer. The selection and proper occupation of a position requires, indeed, great experience in the field, and a natural aptitude for war. Still, every staff officer who has to reconnoitre a position should, at least, be acquainted with the theory of the art. The subject can, therefore, hardly be omitted in a work treating of reconnaissance. Moreover, a staff officer is often intrusted with the command of an independent detachment, and should be competent to select suitable positions for it.

Military positions are either *defensive* or *offensive*. In either case, they must be chosen with reference to the position of the enemy, and must command the approaches to the position in the first case, and the “*débouchés*” from the position in the second case.

A good military position should fulfil as many as possible of the following conditions. Few positions will fulfil them all.

1. It should command a view of the movements of an assailant.

2. Its extent should be proportionate to the strength of the force which is to occupy it, and the nature of the ground should be suitable to the description of arm by which it is to be chiefly occupied.

3. It should not be commanded in front or on the flanks by any higher ground within cannon shot.

4. Its flanks and rear should be secure. The flanks should rest upon natural or artificial obstacles.

5. The position should command the approaches on the enemy's side, and should cover the lines of retreat to a second position, and to the base.

6. The communications in rear of the troops from flank to flank, and to the reserve, should be perfectly free and uninterrupted by ravines, marshes, or other impassable obstacles which would prevent the free circulation of troops from one part of the position to the other.

7. The position should have a sufficient depth to allow of the troops being drawn up in two or more lines, with a reserve.

A flat country will not furnish so many good positions as a hilly one; still they may be found in such a country, particularly where natural obstacles exist, such as villages, woods, marshes, hollow roads, and enclosures.

In selecting a position care must be taken (as stated in No. 2 condition) not only that its extent is not too great for the number of the troops, but also that the nature of the ground is suited for the arm which is chiefly to occupy it. A position may be excellent in itself, yet, from a defect in that particular, it may become useless.

Again, a position may have a very strong front, and yet

the army may be unable to manœuvre in it for want of depth. Another may be formidable in all respects as a defensive position, but the troops may be unable to debouch from it for the purpose of attacking the enemy, and they are thus reduced to the defensive. Finally, a position may be liable to be turned by an unforeseen movement of the enemy.

All these defects should be carefully considered and guarded against in the selection of a position.

The Manner of Reconnoitring a Position.

In reconnoitring a position with a view to its military occupation, the first thing is to ride over it and examine it carefully, and then to make a sketch of it.

The number and description of troops necessary to occupy it, and their distribution, should then be considered. This will depend upon the extent of the position, its strength, the nature of the ground, and the number of the enemy. No fixed rules can be laid down upon this point. Nothing but experience, joined to natural capacity, will enable a general to occupy a position in a masterly manner.

As a rough guide, however, as to the extent of ground which troops cover, it may be said that 5,200 infantry drawn up in line two deep will occupy a mile. But as troops are generally drawn up in two or more lines, with a reserve, this number may be considerably increased, even trebled. Or if the troops are drawn up in column, a still greater number may be placed on that extent of front. At Waterloo, for instance, the British army of 68,000 men occupied about two miles and a quarter of front, while the

French army was quite as closely packed ; so that there is really no general rule about the matter.*

Cavalry and artillery take up more room than infantry, and a very accurate knowledge of the space occupied by the three arms in their several formations is necessary to enable an officer to occupy ground correctly.

The Manner of Occupying a Position.

It is not always necessary that a position should be occupied continuously. Some parts may be held in line, others in column, while others need not be occupied at all. Second and third lines are usually of about the same strength as the first, and may be drawn up in a deployed line, or in a line of columns if not exposed to cannon shot. Under all circumstances there should be a reserve of about one-fifth of the whole force. It should be drawn up in contiguous columns, or in mass of columns, in rear of the position, out of fire, and in the most convenient situation for reinforcing any part of the position.

If a position is to be occupied for any length of time it should, of course, afford the means of supplying water and fuel. Should these means not exist, the general should be informed of it beforehand, so that he may bring these supplies with him.

The depth of a position should (as has been said) be such as to admit of the troops being formed in one or more lines at convenient intervals, and to allow them to be moved from one flank to the other by the rear.

* General Sir J. Shaw Kennedy, in treating of the defence of England, gives as a guide in this respect (to be modified, however, by local circumstances), 20,000 men per mile for the occupation of a position, or line of battle.

An army drawn up in two lines will require six hundred yards of depth of position to answer the above conditions.

The details of the occupation of a position may be determined by the following general principles:—

The nature of the ground will influence the distribution of the several arms.

Infantry may line the heights, and occupy broken and enclosed ground, woods, villages, and houses.

Cavalry will be best employed in the plains and on open ground.

Artillery may be posted in commanding (though not too elevated) places, where the ground slopes gently away to the front, thus exposing an advancing enemy to the full sweep of the guns. All roads leading to the position should be swept by artillery. Guns may also be placed on the salients and on the flanks of a position, and in such a manner as to cross their fire in front. Guns should not, however, be too much scattered over a position, because the chief power of artillery is in its concentration. A battery, or at least half a battery, should therefore generally be kept together.

In posting guns on a hill they should be slightly withdrawn from its crest so as not to be seen by the enemy, The ground at the foot of the hill should then be seen by the guns on either side.

If one flank of a position is secure and the other not so, it may be well to place the greater part of the guns on the flank which is secure, so as to command the approach to the exposed flank; supposing, of course, that the extent of the position is not too great for the fire of the guns to reach from one flank to the other. In the contrary case some guns must be placed in the centre of the position.

In occupying a defensive position the infantry should not be drawn up in a straight line on the top of a hill, but should line the crest following the natural inflexions of the ground. The men will then be able to see down the slopes and command the ascent, bringing in many places a cross-fire to bear upon the assailants. Care must, however, be taken not to expose their flank so as to be enfiladed by the enemy's fire.

But when a line is formed for the purpose of advancing to the attack, the troops should be drawn up in a straight line, which should be preserved up to the moment of collision.

There should be no weak point in a position; consequently cavalry should not be placed in the centre of the first line, but rather on the flanks, and in situations where they will be able to charge suddenly the heads of any columns which may try to establish themselves on the position.

A position should not be divided in two by any impassable obstacle, such as a river, a ravine, or a morass, because in that case the enemy might attack and beat one part of the defensive force before the other part could come to its assistance. On the other hand, these obstacles cannot be too numerous in front of a position on the ground over which the enemy has to pass in order to attack, because the order of his march is thereby broken and the force of his attack weakened.

A good way of judging how to occupy a defensive position is to get in front of it and consider how it should be attacked. The defensive force can then be disposed so as to meet the probable attack.

THE OUTPOSTS.

An army, whether on the line of march, encamped, or drawn up in position, is invariably covered by advanced parties. On the line of march these consist of an advanced guard and flanking parties, whose duty is to precede the main body and examine the ground in its front and on its flanks, and to feel for the enemy.

When the army arrives at the camp or the position it is to occupy, a chain of outposts is immediately established in front for its protection. This chain may be parallel to the main position, or it may cover more especially one or both of its flanks, or it may occupy a semicircular line stretching beyond the flanks and embracing all the approaches to the position.

A system of outposts consists of picquets, with double sentries in their front and supports in their rear. Cavalry vedettes are stationed further in advance, while cavalry patrols are sent out to examine the ground in front of all and beyond the flanks.

The object of outposts is to secure the safety of the troops they cover, and to observe the enemy. Consequently they should be placed not only so that they can discover the movements, the approach, or the retreat of the enemy, but so that in case of attack they may be enabled to check him and give time to the troops in their rear to stand to their arms and to prepare for defence.

An army is often covered by a division which forms the advanced guard on the march and takes the outpost duties at the halts, throwing out its own chain of picquets and sentries in its front, according to the general rules which will be presently stated. In such a case, the covering

division may be at a considerable distance from the main body, as much as several miles in front of it, or even a day's march, taken as an extreme case. When the advanced guard or covering division encamps, as is sometimes the case, on the same ground as the main army, its chain of outposts then becomes that of the main camp or position. The exact distance at which the outposts should be placed beyond the main position or camp cannot be reduced to any fixed rule, because so much depends upon the nature of the ground and the strength and composition of the outposts themselves. A strong chain of picquets can obviously be pushed out further than a weak one, and cavalry can be employed at a greater distance from the main body than infantry.

If the outposts are too far from the main body, there is the danger of their being destroyed before they can be supported; while, on the other hand, if they are too near the main body, the latter might not have time, in the event of a sudden attack, to get under arms. In an average country the furthest infantry outpost may perhaps be three-quarters of a mile from the main body.

The nature of the ground will determine the arm of which the outposts should be composed, as well as the disposition of them. If the ground be much broken, enclosed, or wooded, infantry would be chiefly employed; while in an open country of large plains cavalry would naturally predominate.

The strength of a picquet will depend partly upon the nature of the post it occupies, partly upon the number of sentries it has to furnish. The support may be about three times the strength of the picquet; but these rules are not absolute, and must be modified by circumstances.

The extremities of the line of outposts should rest upon some natural support, and should well overlap the flanks of the position so as to observe all the approaches by which it might be turned. If the nature of the ground affords no such support, the extremities should be thrown back "en potence."

The line of outposts should also be placed behind some natural obstacle, which should even, if practicable, be rendered more difficult by artificial means. When no such obstacle exists, its want must be supplied by redoubled vigilance and activity on the part of the picquets and patrols.

When the front of a position is covered by some natural obstacle, such as a ravine, a marshy rivulet, or a river, the picquets must not be placed on one side of it and the sentries on the other. Both must be placed on the same side, either beyond it or on the near side of it; with the exception, however, of small cavalry posts, which being swifter in their movements, may be pushed out further.

The great principle to be observed in placing a chain of outposts is, that every vedette, sentry, and picquet should be able to see and communicate with the next vedette, sentry, or picquet on either side; and that, while they should be able to observe the movements of the enemy, they should themselves be as little seen by him as possible. But this, like many other very good general rules, is easier laid down than followed.

At night it is usual to draw in the chain of outposts nearer to the main body; but whether this be done or not, redoubled vigilance from all is then required, and all sentries or posts which during the day have been placed

on the tops of hills, should be withdrawn and posted on lower ground, whence they can more readily discover the enemy against the sky line, should he advance, while they are themselves more screened from observation.

Strengthening the Position.

The troops having been thus posted in one or more lines, with their outposts in front, and a reserve in the rear, the next thing is to strengthen artificially such parts of the position as require it, by means of breast-works, scarpments, cuts, abattis, and other obstacles, according to the time and means available, taking particular care to protect the flanks, if they are exposed. Should there be any villages or houses, either in the position or immediately in front of it, they should be strongly occupied, as they often form a prominent feature in the defence; witness, for instance, the château de Hougomont in the field of Waterloo.

Villages have formed in many fields of battle the tactical points of the position, particularly if the position is in a plain. They act, as it were, as fortresses to strengthen the flanks and the front of an army drawn up in line of battle. They also enable the army which holds them to use them as a pivot on which to throw forward a wing. They cover the retreat of an army, as the roads generally lead through them, and if set on fire, form a very serious obstacle to an attack or a pursuit. The possession of them is therefore always obstinately contested.

Among the means of strengthening a position are the barricading of the roads leading to it, and the destruction

of bridges; but it must be recollected that, generally, a commander who fights a defensive battle hopes to repulse the enemy, and then to assume the offensive, and follow him up. Care must therefore be taken not to destroy or block up all the avenues leading to a position so as to render it impossible to debouch from it. The obstructions placed on a road should therefore be such that the road can be reopened and made passable when required. For similar reasons, bridges should generally not be blown up until the last moment, when such a step is absolutely necessary for the safety of the defenders; but they may always be prepared beforehand for destruction by being mined.

Besides strengthening the front and flanks of the position, the communication in rear of the line of troops must be opened from one flank to the other, and also to the reserve, and to the several lines of retreat upon a second position, or to the rear. These communications must be perfectly free, so as to allow the troops to move from one point to another with ease.

The Key of a Position.

In most positions there is one point, the possession of which is of the utmost importance to both attackers and defenders. It is called the key of the position. It is the point the possession of which generally decides the victory. So long as the defenders can retain possession of this point they may dispute the victory; but, once lost, little chance of success remains.

It requires some experience of war to determine which is the key of a position, depending as it does so entirely upon the nature of the ground, the direction of the line of

retreat (which it should cover and protect), the object with which the position is occupied, and the probable direction of the attack. It may be an intrenched village, a wood, a height, or any obstacle, which stops the enemy and protects the movements of one's own troops.

The Sketch.

The sketch of a position should be drawn upon a scale not less than four inches to a mile, and on it should be marked all parapets, epaulments, abattis, entanglements and other obstacles, as well as the distribution of troops.* When the position is on a height, one or more sections of the hill should be given, because no general plan can give an exact idea of the slope of the hills. A landscape drawing of the position will also be very useful.

The Report.

The report should begin by a description of the ground and of the roads leading to the position, and of the obstacles presented to the supposed assailants by the nature of the ground. The probable way in which the position might be attacked should then be discussed, and the arrangements proposed for the defence, as well as the number of troops judged necessary for the proper occupation of the ground, and the distribution and strength of the outposts should be stated in detail. The nature of the works recommended for strengthening the position should also be described, and calculations given of the number of workmen and the time required for their construction. Finally, the means of effecting a retreat

* The troops should be put in to scale.

second position, or to the base, should be discussed, as well as the several ways in which the enemy might be followed up in the event of his attack being repulsed.

Note.—It will also be good practice for the student to consider how he would form a plan for attacking a position, the more so as it more often falls to the lot of British troops to attack a position than to defend it. For details upon the attack of posts see section 9.

SECTION IV.

RECONNAISSANCE OF AN ENCAMPING GROUND.

Principles for the Selection of Camps.

NAPOLÉON says, "The art of encamping a force in a position is nothing else than the art of drawing it up in a line of battle in that position."

Such being the case all the principles which have been laid down in the preceding section for the selection of a position apply equally to the selection of a camp.

The position of the enemy and the nature of the ground, both in a military and a sanitary point of view, must determine the choice of a camp.

The front of a camp should be proportionate to the force which is to occupy it. It should not be of greater extent than the front of that force when drawn up in line of battle. A camp should not be intersected by ravines or other obstacles, such as marshes, rivers, ditches, &c.; and the communication should be quite free from flank to flank and to the rear.

A camp should have its flanks secure, and should not be commanded or enfiladed by any high ground in front or on the flanks within cannon shot. When, however, this cannot be avoided, such commanding ground should be occupied by advanced posts strongly entrenched, and

the camp itself should be protected as much as possible by traverses, retrenchments, epaulments, and scarpments.

A camp must be guarded by its picquets, sentries, vedettes, and cavalry patrols, in the same way as a position, and all that has been said about outposts applies equally to a camp as to a position.

Care must also be taken to secure the means of retreating from it as well as those of debouching for the purpose of attacking the enemy.

A camp should be well supplied with water within a convenient distance and secure from interruption by the enemy. It should also afford the means of fuel, so as to prevent the necessity of its being brought from a distance. The neighbourhood of a camp should furnish as many supplies as possible for the support of the troops.

A camp should be situated upon dry healthy ground, and should of course be accessible from the road.

The details of the several methods of encamping the different branches of the service, as well as the extent of ground required by each, are laid down in the regulation for encampments published by the quartermaster-general's department. They need not be repeated here; but as it is convenient, when selecting a camping ground, to have some fixed general idea as to the space required for encamping a battalion of infantry, a regiment of cavalry, or a battery of artillery of an average strength, and on field service, it may be observed that—

A battalion of infantry of 800 rank and file will require (including its parade ground of 80 yards in depth) from quarter guard to rear guard, a space of 220 yards in depth by 250 yards in length.

A regiment of cavalry of four squadrons, each of 120

men and 96 horses, will require 220 yards of depth and 228 yards of frontage.

A battery of six guns, with 276 men and 244 horses, will require 160 yards of depth by 134 yards of front.

The interval which should be left between the camps of infantry battalions is five yards, that between cavalry and artillery camps is about 34 yards.

Frederick the Great says very truly, that after having laid out three or four encampments, the eye very soon gets accustomed to judge of the space required.

Each arm will naturally be encamped on the ground most suitable to it—remembering, however, that the whole force should be so encamped as to readily fall into line of battle at any moment.

Some military men consider that there should always be a battalion of infantry on each flank of the camp, to protect the horses of the cavalry and artillery from a sudden rush of the enemy in the dark for the purpose of hamstringing them. With this exception the infantry should be kept together, and encamped as near as possible in the order in which they would be drawn up for battle.

It is imperative that the head-quarters, the hospitals, the military train, the commissariat, the artillery, and engineer parks, in short all non-combatant corps, should be encamped in a safe place, generally in rear of the troops. The commissariat, military train, and the parks should also be near the main roads by which they would have to move in case of a retreat. The head-quarters are always if possible established in a house, on account of the necessity of being under cover for the purpose of writing, studying, and receiving visitors.

Camps in time of Peace.

What has been here said about camps applies to those taken up within the theatre of war. When troops are encamped during peace on the march, or in camps of exercise, the same precautions are no longer necessary. In these cases the convenience and health of the troops are mainly consulted, and the facility of obtaining supplies. In every case, however, each regiment must have its quarter guard and rear guard, and adopt whatever police regulations may be necessary.

SECTION V.

RECONNAISSANCE OF A ROAD.

Objects of Reconnaissance.

WHEN troops are about to move in a direction in which the country is not thoroughly known, it is necessary that the roads by which the several columns are to march should be examined and reported on by staff officers, in order that the commander of each column may be furnished with a sketch of the road for each day's march, and a report stating its general nature, the obstructions, difficulties, and delays he will meet with; the means of overcoming these difficulties; the rivers and canals he will have to cross; the defiles and woods he will have to pass through; the supplies, water, and accommodation he will meet with in the towns and villages; the military positions and encamping grounds on the line of march; together with any other information which it may be useful for him to possess.

The staff officers charged with the duty of making these reconnaissances will, when it is possible, precede the troops by a day's march; but in war this is not always possible, either because the country is overrun by the enemy's light troops, or because secrecy as to the direction of the line of march has to be observed.

A reconnaissance of a road consists of a sketch of the road and the country immediately adjacent on either side, and is accompanied by a written report containing infor-

mation upon the several points hereinafter mentioned. The sketch may be on a small scale, one or two inches to the mile, and should show the nature and features of the country in the usual manner.

Points to be Noted.

The extent of country on each side to be embraced by the reconnaissance will generally be stated in the instructions; but in every case all commanding ground within cannon-shot should be included. The report should state the direction and the nature of the road, whether paved, macadamized, gravelled, or not metalled at all; its breadth, and whether uniform or not; any considerable variations of breadth should be noticed. The gradients must be stated, particularly when they are such as to make the road difficult for wheels; its state of repair; the bad parts that will be met with, and what means are at hand for repairing them; whether such bad or difficult parts can be avoided by making a detour; or whether the general direction of the road may be improved by adopting a new line; whether it is practicable for all arms; what rivers and canals it crosses, and whether they are crossed by bridges, ferries, or fords; full details as to the nature of the bridges, their length and breadth; the means of defending or opposing the passage over them; full details as to the nature of the fords and their direction across the stream,* which should be marked by stakes; the woods and defiles through which the road passes; the nature of the woods, whether they are passable for cavalry and artillery; whether placed so as to favour ambuscades,

* See Section VI.

and thus convert the road into a defile ; the breadth of the defiles, and the variations in breadth ; in what formation the troops should pass through them ; whether the heights on each side can be occupied, and whether the defiles may be altogether avoided ; what marshes are met with, and how the road is carried over them ; the towns and villages along and near the road, with full details as to the supplies, water, accommodation, transport, &c., they can furnish. Military positions and encamping grounds should be noticed, and sketches of them upon a scale of four or six inches to the mile should be appended to the report. All points where the march of the column might be advantageously opposed by the enemy should be noticed, and finally every information which can be of use to the commander should be given.

All distances should be given in hours as well as in miles, the latter not being sufficient for the calculation of the time required for the march, as it is evident that it may take as long a time to accomplish one mile of a bad road as two miles of a good road.

Should there be any points in the road where difficulties occur which would oblige the front of the column to be reduced, or which would in any other way delay the march, they should be particularly mentioned in the report, and an estimate should be given of the time required to pass such difficult points.

The accommodation of towns may be ascertained from the mayor or other local authorities ; that of villages may be computed by counting or estimating the number of houses, and ascertaining how many men they would hold on an average, remembering that half the house must be left for the use of the inhabitants.

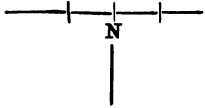
When troops are only to be lodged for one night, a greater number may be put up than if they were to be quartered for a longer time. On the line of march it is not possible to be very particular as to the soldiers' accommodation. The men can be lodged in outhouses and barns, while the horses are put up in open sheds and in farmyards, where they will often be better off than in low, ill-ventilated village stables.

The road report should therefore state whether the accommodation is calculated for one or more nights.

Points to be noted in Railroads.

Railroads are likely to play an important part in future wars—in bringing rapidly up to the front troops, ammunition, and all the “matériel” of which armies are composed. The chief points to be noticed in the reconnaissance of a railroad are its direction, length, and gauge; its construction as regards the country through which it passes, namely, its tunnels, cuts, and viaducts; whether it consists of a double or a single line; the number, size, and situation of its stations; the means it affords of transporting troops of all arms, the number of locomotives and their power; the number of carriages, their class and accommodation; the number of trucks, horse-boxes, and cattle carriages, and their adaptation to the transport of military stores and “matériel;” whether the railway belongs to the state or to a company; the fares; whether the platforms at the stations are adapted to the rapid loading and unloading of the troops, horses, and guns upon the waggons and trucks. The best way of destroying the railway should also be stated.

FORM OF A

 Scale.	Sketch of the road to be in this column, beginning at the bottom of the paper. Towns, villages, positions, &c., to be numbered or lettered.	
The towns, villages, &c., are to be numbered in the sketch, and also in the columns where reference is made to them.	Names of Towns, Villages, and Places on or near the road.	
	Inter- mediate.	Distances in Miles and Furlongs.
	Total.	
	Number of Houses.	
	Population.	

SECTION VI.

RECONNAISSANCE OF A RIVER.

THE examination of rivers is of the utmost importance in war, as they have great influence upon military operations. A reconnaissance of a river is generally ordered with the view of ascertaining how troops may be passed over it for the purpose of attacking the enemy or pursuing the march, or with the view of opposing the passage of the enemy.

The report may be conveniently divided under the following heads, each of which should be treated in detail :—

1. *The Breadth of the river, the swiftness of the current, the Periods when it overflows its banks, and the Extent of country laid under water by its overflowing.*

The breadth of a river must evidently be known in order to enable the commander of an army to throw bridges over it. The swiftness of the current must be known for the same reason.* It is also very necessary that he should know at what seasons he may expect the river to rise or to fall, and to what extent; also at what seasons it overflows its banks, and whether it overflows one or both banks, and to what extent. This knowledge is required to enable him

* For the method of ascertaining this see note at end of this section.

to establish his bridges for the purpose of crossing the river, or to make his dispositions for defending the passage of the river against an enemy. Moreover, an army may find itself seriously compromised if when retreating before an enemy it comes upon a swollen, impassable river, and finds all its bridges carried away. The means of producing inundations by forming dams across a river should also be ascertained and described in the report.

2. *The Fords.*

Nearly all rivers are fordable at some points. It is very important to discover these fords, and to obtain an accurate knowledge of their direction across the stream, their depth, the nature of their bottom, and the rapidity of the current.

There are many ways of ascertaining the fords of a river :

1. By questioning the natives who live on its banks. They generally are acquainted with all the fords, though they will not always impart their knowledge to an enemy.
2. By walking along the bank and observing the traces of roads or paths leading into the river. The marks of wheels entering a river are a good indication of a ford, particularly if these wheel marks re-appear on the opposite bank.

Houses or villages on opposite sides of the river frequently indicate a ford which connects them. It was thus that Sir A. Wellesley guessed the existence of a ford, the discovery of which led to the battle of Assaye.

3. By dropping down the river in a boat with a sounding-line or pole of the given depth of the ford sought for ; whenever this pole or line comes in contact with the bed of the river a ford may be looked for.
4. By certain known indications, such as a swifter or broken current in some parts of the river, particularly near bends and loops.

No means of discovering the existence of fords should be neglected, and when discovered their direction and the nature of their bottom should be carefully examined.

In mountainous countries the bottoms of fords are generally encumbered with large rolling stones. Such fords are bad for cavalry and artillery. Fords with sandy bottoms are also bad, because after many horses or carriages have passed over them they become soft and impracticable for the rest of the column. For this reason infantry should pass over the ford first, then the cavalry and artillery. Fords with a hard gravel bottom are the best.

The direction of a ford should be carefully marked out by setting up posts along it, particularly when its direction is slanting across the river. The breadth and depth and rapidity of the stream must also be noted. The breadth of the ford will determine the front of the column in which troops can cross over ; the depth and rapidity of the stream will determine for what description of troops the ford is passable.

For cavalry a ford should not exceed four feet three inches in depth, supposing the bottom to be firm.

For infantry, under the same condition and with a moderate stream, it should not exceed three feet three inches ; and for artillery, when the ammunition is on the limbers, two feet six inches.

If the stream is very rapid its force may be broken by posting cavalry across the upper part of the ford; the infantry can then cross below the cavalry.

The period of the year at which a ford is examined should be stated in the report, and a post showing the height of the water at the time should be set up; but a ford should be always re-examined immediately before the troops have to pass through it, as its depth is likely to vary.* If the banks are steep and difficult of access they must be cut down and made practicable at each end of the ford. The report should also state what roads lead to the fords, and which of the banks commands the other, so as to protect or dispute the passage.

When the front of an army is protected by a river, it may be necessary to destroy the fords for the sake of greater security. Fords may be destroyed by throwing in trees or harrows, or by cutting trenches across them. The local means of destroying them should therefore be mentioned in the report.

3. *The Nature of the Banks.*

State whether the banks are flat, or broken, or precipitous; whether one bank commands the other (a point of the utmost importance in the passage of rivers); whether the ground on either side is marshy; whether the banks are nearly even with the water or high above it. The

* Fords have been known to become impassable in the course of even a night, and much inconvenience has been experienced in consequence; for examples of which see Appendix, Note A. Officers who are charged with the duty of reporting upon rivers should therefore pay great attention to this matter.

poured on it, which then freezes, the bearing power may be further increased.

In hot climates rivers frequently become shallow at certain seasons, and sometimes dry up altogether; as, for instance, the Great Fish River at the Cape of Good Hope. The reconnoitring officer should make inquiries upon this point, and embody the result of his information in the report.

All the affluents of a river, within the front of operations, should also be examined and reported on in a similar manner.

Canals.

Canals and minor streams are reconnoitred in a similar manner, and the means of forming inundations, and destroying the locks, or the canals themselves, should be considered.

Note on the Method of ascertaining the Swiftness of the Current of a River.

The swiftness of a river varies according to the height of the water. The height of the water at the time of measurement should therefore be mentioned.

The swiftness of a river is not uniform, either in respect of its breadth or its depth. It is generally swiftest where the bed is deepest. The Germans call that line the "Thalweg," or "path of the valley," because it follows the lowest part of the valley in which the river flows.

It has been ascertained that the greatest swiftness of a river is just below the surface of the water, while its least swiftness is at the bottom of the water.

Hence, to ascertain the swiftness of the current of a river, set up two flags on the bank at any convenient dis-

tance from each other, and parallel to the direction of the current. Throw into the "Thalweg," above the upper flag, a piece of wood or cork, which will be but little affected by the wind. Observe very accurately (with a watch which has a "second" hand) the time taken by the "floater" in passing from one flag to the other. Repeat the operation several times, and take the mean.

If the bank of the river is unsuited to the purpose, or if the "Thalweg" is too far from the bank for the "floater" to be distinctly seen, the operation may be performed by anchoring two small boats in the stream, and proceeding in the same manner as with fixed flags.

The swiftness of a current may also be measured by means of the ordinary naval "log," in the same way as the rate of a ship's progress is measured at sea.

If it is desired to know the mean velocity of a river, the following formulæ may be used. Let U be the swiftness at the surface (measured as above), V the mean velocity. Then

If U is less than 1·2 foot per second $V = 0·75 U$.

If U is between 1·2 and 4' „ $V = 0·84 U$.

If U is between 4' and 8' „ $V = 0·85 U$.*

Rates of Velocity of Rivers.

A river is said to be sluggish when it flows at the rate of 1' 6" per second (about 1 mile per hour); ordinarily swift from 2' to 3' per second (about 2 miles per hour); rapid from 3' to 5' per second (about 3 miles per hour); very rapid from 5' to 8' per second (about 5 miles per hour); a torrent from 9' and upwards (about 6 miles per hour and upwards).

* Laisné (Aide Mémoire des Officiers du Génie).

SECTION VII.

RECONNAISSANCE OF A WOOD OR FOREST.

THE principal points to examine in a wood or forest are—

1. Its extent.
2. The nature of the ground—whether flat or hilly.
3. The roads that cross it, their nature and direction.
4. The rivers and streams which flow through it, or out of it.
5. The ravines and the nature of their bottom.
6. What parts are open and practicable and what impracticable.
7. The towns, villages, farms, and patches of cultivation.
8. The marshes.

The plan of a forest should distinctly show what parts are practicable and what parts are impracticable, and the roads should be clearly traced throughout their whole extent.

It would be well to go round the wood to ascertain its extent, noting all roads that come out of it, and ascertaining whence they come and where they lead. In like manner all rivers and ravines which come out of the forest should be carefully observed.

The chief point to ascertain in a wood is the manner of getting troops through it. The roads are therefore of

the greatest interest; an examination of the roads will also show what parts of the forest are practicable and what are impracticable for troops.

The closeness of the trees to each other, and the state and nature of the underwood, are material points for the passage of infantry and even of guns. They should be carefully noted.

By following up the ravines and rivers a good exploration of a wood may be effected.

Towns and villages in woods are generally situated at the junction of the roads; they are therefore important points to note.

SECTION VIII.

RECONNAISSANCE OF A DISTRICT.

THIS is an extensive operation, and if undertaken in a friendly country, with plenty of time at command, may be made to embrace a great variety of information, extending even to the statistics, the public works and buildings, the colleges, the manufactures, the trade, the army and navy, the government, and the whole political economy of a country.

But the reconnaissance of a district for strictly military purposes is ordinarily confined to the following heads:—

Heads of Reconnaissance.

1. The features of the country.
2. The roads, railroads, woods, defiles, &c.
3. The rivers, canals, lakes, marshes.
4. The towns, villages, and farms.
5. The produce and supplies.
6. The population.
7. The means of transport.
8. The military positions and camping grounds; and general military considerations.

A reconnaissance of this nature is usually performed by several officers, who divide the district among them, and a general plan and report is drawn up from the

whole. Such a reconnaissance is best performed on horseback.

Some kind of map of the country about to be examined can always be procured, which, although possibly very inaccurate, will serve as a guide to the officer, who may verify and correct it as he rides along; or he may, if he prefers it, transfer some of the principal points from the map to his sketching paper, and then fill in the details of the country as in an ordinary field sketch.

The sketch or map should be on a small scale, one or two inches to a mile; remembering, however, that when particular positions are described, a separate sketch of them on a scale of four or six inches to a mile should be appended.

Upon the general sketch of the district should be shown the features of the country, namely, the direction of the mountains and ranges of hills, the "watershed," as it is termed; the general course of the rivers and streams, with their bridges, ferries, and fords; the lakes, marshes, canals, and sea coasts; the roads, railroads, causeways, cuttings, and defiles; the woods and fences; the cultivated and uncultivated ground; the enclosed and the open country; the towns,* villages, farms, and large buildings.

The height of the principal hills above the level of the sea, or of the lowest valley of the district, should be marked on the sketch, or, if that cannot be ascertained, the relative heights of the hills to one another should invariably be marked by the numbers 1, 2, 3, &c., 1 being the highest. The high roads should be clearly distin-

* The class of town might be denoted on the sketch, either by writing down the population in round numbers thus (5,000) under the town, or by using symbols to denote certain classes of towns.

guished from the bye roads by being coloured light-brown. Rivers and all water should be coloured blue.

The Report.

The report should be written on half margin paper, and should be drawn up under the following heads, which should be written in the margin.

1. *Features of the Country.*

The boundaries of the district reconnoitred should be stated in general terms, and its area in square miles should be given, as well as a general description of its physical features (watershed and course of streams), and geological structure.*

Describe the general nature of the ground, whether it is mountainous or undulating, broken or flat; the height and slopes of the mountains and hills; the extent of country under cultivation; the nature of the crops; the size of the fields, and the nature of the fences; the extent of uncultivated or unenclosed ground; the quantity of wood, its nature, whether coppice or of large timber, and whether

* There can be no doubt of the value of a knowledge of geology in operations of this nature. The form of ground and the features of the country are influenced by the geological nature of the soil, and an officer who is acquainted with the different forms which the surface of the earth assumes according as it is composed of chalk, gravel, or plutonic rocks, evidently possesses an additional element of facility in sketching and describing country. Moreover, any geological information which may be embodied in the report of a reconnaissance cannot fail to contribute both to its general usefulness and interest. In the present day, indeed, a survey and report upon a country would not be considered complete unless it contained some amount of geological information.

practicable for cavalry and artillery; and any other information which may appear to be useful.

The slopes of hills to be particularly noticed for military operations are those of

45° inaccessible only for infantry except as skirmishers.

30° very difficult for cavalry, inaccessible for guns.

15° accessible for guns, and the limit of "manœuvring ground."

2. *Roads, Railroads, Woods, Defiles.*

The particulars to be noted under this heading have already been stated in Sections V. and VII., and need not be repeated here.

3. *Rivers, &c.*

The reconnaissance of rivers and canals has also been fully explained in Section VI., and need not be repeated.

Lakes.

Ascertain their size, shape, and depth, and how they can be brought to bear in any scheme of military operations. State the number of steamboats and other boats plying upon them, and what number of troops could be placed on board.

Marshes.

Note their shape, extent, depth of water, and how far they are practicable in winter and in summer; the quality of the bottom; whether they are traversed by causeways, and if so, whether these are commanded, easily destroyed, or repaired. Their breadth should also be particularly stated. Swampy meadows should also be mentioned, as

in winter they are often impracticable for cavalry and artillery.

The general healthiness or otherwise of the district reconnoitred should be stated, and malaria, where it exists, should be specially reported.

Sea Coasts.

State whether they are open or precipitous; note all places favourable for the embarkation or disembarkation of troops; state the means of opposing a landing afforded by the nature of the ground; ascertain the description of anchorage in the bays, and the prevailing winds and amount and period of tide.

4. Towns, Villages, Farms.

Describe their situation and size; whether fortified or open; the means of defending them; the number of troops that could be quartered in them, either permanently or on the march; the number of inhabitants; their general trades and occupation; whether friendly or hostile in their feelings. The supplies, transport, horses, and other animals; the number of bakeries, butchers' shops, mills, and forges.

This information may be stated in a tabular form (see end of the section).

5. Produce and Supplies.

State the general nature of the cultivation—whether corn, pasture, vines, or olives, distinguishing the quantity of arable land and of pasture land; the quantity of uncultivated and barren land and wood; the nature of the

standing crops and the time of the harvest; also whether the corn is fit to be gathered in; the quantity of hay, straw, oats, barley, and wheat in stacks or in barns; the quantity and average size and weight of cattle, sheep, goats, that can be supplied; and in general terms the time during which the occupying corps might be fed in the district;* all which information may be obtained from the farmers and other inhabitants.

Calculation of Supplies.

The contents of a hayrick may be calculated by ascertaining the number of cubic yards in it, and multiplying by 200 lbs., as a cubic yard of stacked hay weighs about 200 lbs.

A cubic yard of stacked straw weighs about 140 lbs.

To measure grain easily, make it up in rectangular forms which can be reduced to cubic yards; each cubic yard of grain will contain about $20\frac{1}{2}$ bushels.

A bushel of maize weighs 66 lbs.

„	wheat	„	62	„
„	rye	„	58	„
„	barley	„	54	„
„	oats	„	42	„

This information may be useful when foraging.

6. Rural Population.

Note their character and general health; occupation and trades; whether friendly or hostile; state the number

* In making this estimate it will not do to adopt the principle of a certain foreign marshal that the inhabitants of a country are only entitled to the superfluity of the army! From one-third to one-half of the produce should be allowed for the inhabitants.

of labourers that could be procured for the purposes of repairing roads, throwing up entrenchments, felling trees where required, as well as the number and the nature of the tools that could be supplied by the population.

(This information also may be given in a tabular form.)

7. The means of Transport.

The information upon this head should also be drawn up in a tabular form, and should state the number and description of waggons, horses, carts, and mules available at each town and village, and generally throughout the whole district, and what weight each description of carriage will safely bear; also what weight the horses and mules of the country would be able to carry on pack saddles.

8. Military Considerations.

Under this head the features of the district should be considered with reference to their bearing upon any plan of campaign which may be denoted in the instructions as being under consideration; the obstacles or facilities which the district would offer to such plan, either by means of its mountains, hills, rivers, roads, or forests.

The best positions to be occupied with a view to the operations of the campaign should be pointed out and described, and a sketch of them should be annexed to the report. The lines of operation either covered or impeded by them should also be stated.

Positions and Camps.

Any positions favourable to the enemy must also be noticed, with reflections as to the means of turning or attacking such positions.

The same details should be given with respect to places adapted for entrenched camps, or for mere camps of passage.

In the article on "Reconnaissance," in the "Aide Mémoire," will be found full information upon the reconnaissance of a district, as laid down in the instructions issued to the quartermaster-general's department in the Peninsula by Sir George Murray.

Means of obtaining the Information above mentioned.

Much of this information with respect to the supplies, accommodation, population, and transport of a district must necessarily be obtained from the inhabitants of the country. If the reconnaissance is carried on in a friendly country, it is comparatively easy to acquire all necessary information from the local authorities, farmers, and others; yet not always so, because when the farmers observe several officers riding about the country, asking all sorts of questions as to the nature and the amount of the produce of their farms, their horses, their cattle, their sheep, their pigs, their carts, and their waggons, they begin to fear that their taxes or their rents are about to be raised, and they become very chary of their information.

If then this difficulty exists, even in one's own country, in time of peace, how much more will it exist in an enemy's country in time of war, when it may be the interest of the inhabitants to mislead the reconnoitring officer in every way? It is true that in this case the officer has it in his power to coerce the authorities into giving him information, and laying before him the public records of their offices; still, he must beware of trusting

implicitly the information he receives; he must sift it, compare it with the results of his own observation, and test it in every way; and, finally, he should state in his report the sources whence his information is derived, and the degree of confidence that may be reposed in it.

Note.—It is evident that the reconnaissance of a district, as above described, can only be thoroughly performed when there is plenty of time at command. It might indeed be more properly called a "report," or a "memoir," upon a district than strictly a "reconnaissance," which latter term conveys an idea of a hasty examination made in an enemy's country. Officers will therefore do well to remember that if time does not admit of their making so full a reconnaissance, they must do the best they can, which, however little, will still be better than nothing, provided that what they do is really accurate, and intelligently executed.

SECTION IX.

RECONNOITRING THE ENEMY.

THE reconnaissances which have been described in the foregoing sections may be considered as *defensive*, or undertaken for the purpose of obtaining the information necessary for the combination of marches, the passage of rivers, the occupation of positions, camps, or districts. Those which are now about to be described may be considered as *offensive*, or undertaken for the purpose of discovering the strength and position of the enemy previous to attacking him.

On active service this species of reconnaissance is constantly occurring, and its execution demands great intelligence, caution, and coolness. It cannot be thoroughly practised in time of peace, and can only be practically learned on actual service in the field. Still, in conducting such reconnaissances, certain general rules are to be observed; and it is well that officers should be familiar with these rules, remembering always that they are liable to be modified by circumstances.

The great difficulty of this kind of reconnaissance is obvious. Suppose, for instance, that an enemy is occupying a position, and that a staff officer is ordered to reconnoitre him; that is, to ascertain the strength of the position itself—how it is occupied, and by what number and

description of troops. Conceive the difficulty of doing this when the enemy is not only covered by his picquets, but has even taken care to screen his main force itself from observation. How difficult it is to approach the outposts unseen, and to penetrate between them, and when this has been accomplished there still remains the arduous task of examining the position itself, and ascertaining the strength of the enemy's forces ; and, lastly, of making good a retreat to one's own camp.

Unless the reconnoitring officer can penetrate within the line of the enemy's outposts, the reconnaissance, at the best, can give but an approximate estimate of the number and position of the enemy, and the desired information can only be partially acquired from the inhabitants. Nevertheless, such an imperfect reconnaissance is of some use, and is more or less valuable according to the enterprise and intelligence of the officer who conducts it.

*Reconnaissance of a Position with a view to attacking it.**

A position is either in an open plain, in a broken or close country, or in a mountainous country. In the first case the position will probably be entrenched, and the nature of the ground will render any approach to it, without being discovered, very difficult. Yet the weak points of the position must be ascertained, in order to determine the proper direction to be given to the attack. It is necessary, therefore, to reconnoitre, as closely as they can be approached, either by day or by night, the

* The remainder of this section is taken almost entirely from Chatelain.

nature of the ground whereby the position is protected, and the means of defence which have been prepared. It must also be ascertained how far and to what distance the attacking columns can advance (under cover of woods or other obstacles) without being discovered, as well as the circumstances which exist favourable to an attack, such as villages, good positions to occupy, the best direction to follow, what parts of the ground are favourable for cavalry, and what for artillery.

Such reconnaissances are usually made with an escort, but the officer will hardly fulfil his duty satisfactorily unless he precedes his escort, so as not to attract the attention of the enemy's patrols and outposts.

If the position is in a close or broken country, it may be possible to reconnoitre it more closely than in the preceding case; but, on the other hand, the front of the position will then be more covered by obstacles, ditches, rivers, marshes, ravines, woods, which will afford the enemy so many posts and protected lines more or less easy to defend. The approaches and the course of the streams will be the essential points to examine in such a case.

In a mountainous country, positions often consist of posts connected one with the other; or, if the position be on a table land, it will occupy commanding ground, and will probably be covered by ravines, scarpments, and other obstacles, whose existence it is essential to know, so that the assailant may not run his head against the most formidable part of it. The reconnaissance of such a position is therefore most important. Officers should consequently be employed to examine the avenues by which the attack can be made, and to approach as

near as they possibly can to the works or obstacles which protect the position.

Positions in mountainous countries being, when well chosen, extremely strong, it is generally better to turn than to attack them. The reconnoitring officer will therefore consider the means of doing so. But sometimes it is absolutely necessary to seize by force a strong post which closes a passage which the assailant must have possession of.

An offensive reconnaissance may be conducted in two ways—either (as has been already stated) by stealing upon the enemy unseen, and thus gaining some position from which the distribution of his forces may be observed; or by forcibly driving his picquets from some elevated spot which commands a view of his forces, and making the best use of one's eyes during the short time which may elapse before the reconnoitring party is driven off again. In such an operation prisoners are often taken, from whom information may be gained.

The secret reconnaissance of an enemy is performed by an officer accompanied by a small escort, generally of cavalry, to which infantry is sometimes added. The escort should consist of picked men, and the officer should, if possible, be personally acquainted with them, in order that he may employ them to the best advantage. He should communicate to them the object of the reconnaissance, so as to make sure of its accomplishment, even if he himself with part of his escort should be taken prisoners.

If the object be to penetrate within the line of the enemy's outposts, the party should leave their camp so as to arrive at the outposts in the dark, in order that they

may have the best chance of evading the enemy's patrols and sentries.

If the object be merely to gain what intelligence they can as to the intentions and movements of the enemy without penetrating within the line of his outposts, the reconnoitring party may set out at any time.

In either case the officer in command must proceed with the greatest caution. During the day he should be preceded at the distance of two hundred or three hundred yards by a corporal and a few dragoons, accompanied by a guide. This small advanced guard should throw out a file a short distance in front, and when necessary, on each flank, in order to search the country. At night this advanced guard had better join the escort for fear of losing itself in the dark.

The detachment must take every precaution to conceal its march from the enemy, and should take advantage of all inequalities of ground, hedges, woods, standing corn, &c., to advance unseen. All hills must be examined by a man on foot, who creeps up to the top, and looks all round to see that there is no enemy near before he gives the signal to the party to advance.

In like manner the escort must never commit itself by entering a town, village, wood, or defile, without first sending on one or two men to see that it is free from the enemy.

According as the party advances, the officer in command will inquire of the inhabitants as to the movements of the enemy, and their supposed strength and position. He will carefully examine the country, and note such places as appear favourable for covering his retreat in case of need. He will also make notes of everything

which he may think will be of use to the general in command.

When he approaches the enemy's outposts he must redouble his precautions. If he can find some inhabitant of the place who will lead him to within sight of the enemy's bivouac fires, he will take him with him. When in sight of these fires he will divide his escort into several parties, leaving them concealed here and there along the road. He will then, either alone, or accompanied by two or three determined men, endeavour to penetrate between the vedettes and outposts. If he is discovered in this attempt he must gallop back to his nearest support, favoured by the partial obscurity and by the fear of the enemy, who on seeing him joined by other horsemen will suspect an ambuscade.

If the officer succeeds in penetrating the outposts unperceived, he will at break of day make whatever observations he can (before he is discovered) of the strength of the enemy's position, the manner in which it is occupied, and the forces occupying it. He will then endeavour to rejoin his escort, and make good his retreat to his own camp.*

* The following graphic account of a dashing reconnaissance of the enemy's position, made under fire, is given in Napier's *Peninsular War*, vol. vi:—

"One of these bodies (of the enemy) was posted on a hill, the end of which abutted on the high road, the slope being clothed with trees, and defended by skirmishers; it was essential to know whether a small or a large force thus barred the way, but all who endeavoured to ascertain the fact were stopped by the fire of the enemy. At last Captain William Light, distinguished by the variety of his attainments, an artist, musician, mechanist, seaman, and soldier, made the trial. He rode forward as if he would force his way through the

In the above duty he should avoid as much as possible all collision with the enemy; his object being not to fight, but to gain information.

On regaining his camp he will make his report, simply stating what he has heard and seen.

In such a reconnaissance great care must be taken not to be misled by appearances. Cattle, haycocks, sheaves of corn, are often mistaken for the enemy by officers whose eyesight is defective, or whose nerves have not been strong enough to allow them to approach sufficiently near to such objects.

Offensive Reconnaissance of a Fortified Post or Village.

Previous to attacking a fortified post, it is necessary to know the nature of the ground on which it is situated, the roads which lead to it, the amount of help which it can receive from the corps to which it belongs, the strength and the trace of the works which defend it, the number and the quality of the troops which occupy it, the character

French skirmishers, but in the wood dropped his reins, and leaned back as if badly wounded; his horse appeared to canter wildly along the front of the enemy's light troops, and they, thinking him mortally hurt, ceased their fire, and took no further notice. He thus passed unobserved through the wood to the other side of the hill where there were no skirmishers, and ascending to the open summit above, galloped along the French main line, counting their regiments as he passed. His sudden appearance, his blue undress, his daring confidence, and his speed, made the French doubt if he was an enemy, and a few shots only were discharged; but he, dashing down the opposite declivity, broke from the rear through the very skirmishers whose fire he had essayed in front, and reaching the spot where Wellington stood, told him there were but five battalions on the hill."

of the commandant, how the duties are carried on; if a town or village, the number of inhabitants, and their feelings toward the garrison.

It cannot be expected that all this information can be acquired immediately; but it may be gained from persons who know the locality, or who have seen the post established, from spies and deserters, and lastly from personal observation.

It should be ascertained whether the post is commanded or not—whether it is on a height or a plain.

If commanded, the distance it is from the ground which commands it should be known, and whether such ground is favourable for the attack; also what measures the defenders have taken to cover themselves from such attack.

If the post is on a height, ascertain its elevation, steepness, the most accessible sides, the means of defence; whether it is accessible on several sides.

If in a plain, observe the nature of the ground round it, the obstacles—such as marshes, ravines, rivers—whether there are woods and hollows which might conceal ambuscades; whether there are any villages where the attacking party might establish itself; whether the country furnishes wood from which fascines can be made; whether the enemy can inundate the approaches to the post; ascertain the number of the roads leading to the post, their nature, whether the post is connected with the corps to which it belongs by other posts and safe communications, or whether the communications can be intercepted.

In the reconnaissance of a post or a position, the following objects should be examined in detail:—

Abattis.—Observe the construction of the abattis, whether the trunks are fastened together, and how; if the abattis

is commanded, if it can be turned, if the ends of the trees are buried in the ground, and if there is a parapet behind it; the means of burning or otherwise destroying it.

Other obstacles, such as palisades, fraizes, hedges and ditches, troupes de loup, &c., should all be carefully examined and reported upon as to position, strength, means of overcoming them.

Cemetery, Farmyards, &c.—The thickness, the height, and the nature of the walls, whether loopholed, or how defended; if it is commanded, and, if so, at what distance; the best way of gaining possession of it.

Defile.—Its breadth, length, nature of the ground on each side, how it may be attacked, whether it can be turned.

Fieldworks.—Note their trace, their extent, the flanking defences, the command, the thickness of the parapet, the breadth of the berm, breadth and depth of the ditch, whether wet or dry, whether it has a cunette, the best means of crossing the ditch, the height and slope of the glacis; the obstacles, such as palisades, fraizes, abattis, troupes de loup. The nature of the ground near the post, and the facilities it affords for any attack.

Gardens.—Whether they are walled. If so, the height, and whether loopholed; whether prepared for defence, and how they could best be seized.

Hedges.—Their nature, and whether they could be used for ambuscades, or defence, and whether easily converted into a parapet.

Marshes.—Depth of water, quality of the bottom, parts where they are practicable, whether they could be easily drained, what causeways cross them, and whether they are available for the attack or the defence.

Ravines.—Note the best places for crossing, in order to attack; means of defending them.

Rivers and Roads.—For what to observe on these heads, see Sections V. and VI.

Tambours.—Their position, the strength of the posts of which the tambour is constructed, how it is covered and loopholed.

Woods.—Observe where they are penetrable, and where impenetrable, whether infantry can traverse them easily, whether there are roads through them which are practicable for cavalry and artillery, whether the trees are fit for making abattis, &c. (See Section VII.)

RECONNAISSANCE OF A VILLAGE.

The reconnaissance of a fortified village demands the same preliminary inquiries as that of a fortified post, with the following additional ones: If the village has been protected by several works, the mutual defence afforded by these works must be ascertained. The nature, construction, and trace of these works must also be noted. In this way their relative strength will be discovered, and the work upon which the principal attack should be directed will be ascertained.

The next thing to be observed will be what approaches have been blocked up and by what means; how the enemy has prepared the houses, bridges, &c., at the entrance of the village for the purpose of defence; how he has barricaded the streets; in what buildings he has quartered his troops, and where he has established his "reduit" or citadel.

Information should also be gained as to the plan of the

village, the position of the churches, the means adopted for the internal defence, the number of inhabitants, their occupation, the supplies in money, cattle, carts, &c.

All this information may be obtained in the following manner: 1. By good maps and plans of the place, which should be verified by observation. 2. By the reports of spies and deserters. 3. From prisoners of war and friends within the place. 4. From the inhabitants of the neighbourhood, the tax-gatherers, gamekeepers, woodmen, men and women of all kinds, and from soldiers who know the country. 5. Finally, from reconnaissances.

In making these reconnaissances one is first of all guided by the information obtained as above mentioned, and compared one with the other. Certain precautions must be observed in the execution of these reconnaissances, to avoid being discovered and falling into an ambushade. Yet it is essential that the commander of the attacking party should personally examine the ground between him and the post, so as to avoid fatal errors in the attack. Such a reconnaissance should be made by night in the following manner.

The commander, accompanied by two or three officers, will proceed towards the place by the road by which he intends his troops to move to the attack. Of the officers who accompany him one will be desired to examine the roads and their embankments; another will observe the obstacles, the bridges, heights, defiles; a third will note the streams, ravines, marshes, &c. These officers will be instructed to leave upon the objects which are to be avoided, and upon the roads which are to be followed, certain marks which may be easily recognized, such as a notch, or a blaze upon the trunks of the trees, or by

breaking the branches.' They will take notice of any remarkable objects on the side of the road, such as a mound of earth, a single tree, a signpost, a bush &c., all which will serve as guides; and when the intrenchments are reached, they will measure with poles the height of the works, the depth of the ditch, and any other dimensions which may be necessary.

The officers who make such a reconnaissance should advance in the greatest silence, with dark-coloured great-coats on, stopping frequently to listen whether any patrol is approaching. In such a case they must hide behind some object till the patrol has passed.

When the reconnaissance is finished each officer will, on regaining his quarters, hand a report of what he has observed to the commander, who, after considering all the information obtained, will form his plan of attack.

The Report.—The report upon an offensive reconnaissance should be written in a simple manner. It should begin by quoting the instructions received, so as to show how the execution has answered the object of the reconnaissance. A short account is then given of the nature and configuration of the ground about the post to the distance of cannon-shot, if the post is such as to require to be attacked by artillery, or rifle shot if it is only necessary to attack it with infantry. The roads by which the post may be reached, and the obstacles which will be met with are then described. The nature of the defences of the post should then be stated, as far as they have been ascertained, together with whatever observations or information have been acquired during the reconnaissance. The means of attack should then be described, together with the means of resistance likely to be resorted to by the defenders.

Armed Reconnaissances, or Reconnaissances in Force.

These reconnaissances belong more to the province of the general than to that of the staff officer; a slight sketch of the manner of conducting them is therefore all that is necessary to be given.

A reconnaissance in force is directed either by the general in chief or by a general officer named by him. The whole of the troops remain under arms during the reconnaissance, and sometimes the greater portion of them take part in it. The object of the operation is to ascertain exactly the strength of the enemy in the position occupied by him, and in order to effect this object he is forced by hostile demonstrations to withdraw his outposts and draw up his whole force in battle array. These reconnaissances are often the precursors of real attacks and even of battles, and should not be undertaken with forces insufficient to engage the enemy if necessary.

The force employed in this operation should consist of troops of all arms, and during its execution the rest of the army is held ready to march, either to support the reconnoitring force if it should be attacked, or to engage in a general action if the enemy should put his army in motion for that purpose. If conducted with prudence, however, collision may usually be avoided. The general advances steadily, forcing the outposts to retire without fighting, deploying his troops by successive echellons, charging with his cavalry when in the plain, searching the woods, villages, and broken ground with his infantry; sounding the fords, observing the course of the rivers, the nature of the ground, the bifurcation of the roads and their nature, in a word noting everything he wishes to know. When he

has reached an eminence whence he can observe the enemy's position, he surveys the line with a rapid eye, estimates its strength, meditates his own plan of attack, and should the enemy put himself in motion to attack him, he retires slowly upon the echellons which he has placed to secure his retreat.

In these reconnaissances staff officers accompany the troops and make sketches of the ground, and note the position of the enemy's forces and the strength of his corps, sending in their reports to the general who has conducted the reconnaissance.

APPENDIX.

NOTE (A).

WITH reference to the sudden variations in the depth of fords, which often occur, the following personal experience of a distinguished officer of engineers* is given :—

“When the army advanced through the north of Portugal the river Esla had to be crossed at several points many leagues apart from each other.

“A ford had been pointed out as the place where two brigades of cavalry and horse artillery, with two divisions of infantry, were to cross. When the cavalry arrived at the bank of the river, they pushed on and crossed without difficulty ; the water in the river was shallow, and the bed of it, which was loose ground and boulders, was nearly dry, and did not in its then state present any obstacle. Scarcely had the cavalry passed when the water began to rise, and soon changed the character of the river from a quiet, sluggish stream into a broad sheet of water, rushing down with great rapidity and expanding into a river of some hundred yards in breadth, and no longer fordable.

“As soon as the cavalry had crossed the river, a report was sent to Lord Wellington, who immediately ordered

* The late General Sir H. Jones, the “*intrepid Harry Jones*” of Napier’s “*Peninsular War*.”

two divisions of infantry, 3rd and 5th, to march and cross the river at the same place. Before the order to move the divisions was received some hours had passed ; in the meantime the river had completely changed its character from a narrow, shallow stream, flowing quietly in a broad bed, to a broad torrent no longer passable.

"The staff had advanced with the cavalry, and when the infantry arrived at the ford there was not any officer who could point out the direction of the ford. An officer of engineers attached to the 5th division, who was mounted on a large powerful horse, volunteered to cross the river in the supposed direction of the ford, and accompanied by two grenadiers of the 94th regiment, dashed into the river. The men soon lost their footing and were carried rapidly down the stream and drowned.

"The officer had nearly reached midway when the horse became suddenly alarmed, turned round, and rushed back to the point from whence he had started. It was then decided that the rear division, the 5th, should move and cross by the pontoon bridge a few leagues down the stream. Thus by the sudden and unexpected rise of the river two days' march were lost."

"1813. A short time previous to the opening of the campaign of 1813, orders were received by the general officer in command at Lamego to direct the officer of royal engineers attached to the 5th division to reconnoitre and report as to the practicability or difficulties of passing a division of troops and artillery across the river Douro, and the probable time that would be required to perform the operation.

"The division would be about 5000 men, 12 guns with horses, two regiments of cavalry, the usual number of

mules for commissariat, waggon train, carriages for sick, &c.

" The approach to the river was by a long, narrow, and very steep road down the side of a mountain, debouching upon the river opposite the small village of Pezo da Regoa. The water in the river was very low, with a gravelly bottom; in the centre of the stream was a small island, with a navigable channel for river craft on one side, which would easily be made passable by using some wine boats (which were lying at the village a short distance below the point where it was proposed to ford the river) and forming a bridge. The road from Lamego joined the river immediately opposite the island. Under the circumstances above stated, the officer made a favourable report of the great facility that existed for the passage of the river, provided that no freshet came down from the mountains above which would render the river impassable.

" The report was approved at head-quarters, and arrangements made accordingly, to be acted on when the army was ordered to advance, under the impression that no check would be experienced, and that the troops upon arriving at the river would be able to proceed on the march without any delay.

" Unfortunately, the night of the day previous to the receipt of the order for the move of the troops, a torrent of rain fell on the mountains and descended with great velocity. This could not be known in time to make any preparation for crossing the river, and when the troops arrived at the bank of the river, instead of a narrow channel, the river rather presented a great breadth of water rushing down with terrific violence; the river was impassable,

and the troops were obliged to remain in the narrow road on the mountain side on which they had halted; there was no possibility of moving or retreating up the mountain into an open space. This unexpected stoppage caused great delay and inconvenience, and it was only after the freshet had passed that the river could be crossed by rafts formed by the boats on the opposite side of the river."

NOTE (B).—SINKING OF BOATS.

"On the retreat from Burgos in 1812, Lord Wellington, looking forward to the operations of the following year, gave directions that any bridge which it became necessary to destroy should not be blown up until the enemy was *actually on the bridge*. Lieutenant Jones, R.E., had been employed all one night lying on the centre of the bridge at Cabezón, which was charged for destruction, the enemy at one end and a British picquet at the other, the engineer officer in the centre between them, ready to light the portfire of the mine the instant the enemy should attempt to advance. He, however, remained quiet during the night. At daybreak, Lord Wellington came to the barricade in the centre where the mine was placed; after many inquiries from the engineer officer as to the position of the enemy's troops, &c., he retired. Shortly afterwards Lieutenant Jones was relieved, and ordered to go to Toro, forty miles lower down the river, and to take with him a muleteer and two barrels of gunpowder, mine the bridge, and destroy it when the enemy should enter the town. On reaching Toro, Lieutenant Jones left his horse with

the muleteer at the bridge and ascended to the upper town to find the alcade; the population were in a state of great excitement, the enemy being expected every hour. The engineer, who spoke Spanish fluently, had no difficulty in making the Spaniards understand him, and thereby persuaded a large number of the men to assist him to destroy the bridge. It was just nightfall, and when it became dark a dead silence ensued; the noise of the tools on the masonry had ceased, the Spaniards had retired, leaving the engineer and muleteer to do their best. In the almost certainty of the enemy coming into the town during the night, Lieutenant Jones determined to do his best to destroy the bridge with his two barrels of powder emptied on the roadway, and with some '*yesca*' obtained from the muleteer. After several ineffectual attempts he succeeded in throwing a lighted piece of it upon the powder, which instantly exploded. As he could not do anything more, whether successful or not, he and the muleteer retired to the nearest house and passed the night, returning to the bridge before daylight, carefully looking on to ascertain if the enemy could be seen in the town. No signs of any. Inquiry was made, and a punt having been found a short distance up the river, he crossed in it, and advancing cautiously ascended to the alcade's house, in order to procure all the information possible respecting the enemy and his movements; and fortunately so, for he was shown a letter just received from the French general ordering 'preparations to be made for — thousand rations 'by twelve o'clock.' The engineer wanted to take the letter to Lord Wellington; the alcade said he could not do so, but that he would give him a certified copy of it, which he did; and ascertaining from him where any boats or

barges could be found, he sent some people to bring them across the river. This was done, and both sides being cleared of them, they were all destroyed by knocking holes in the bottoms and thus sinking them.

The importance of this duty will be seen from the circumstance that on his way back to head-quarters two staff officers passed Lieutenant Jones on the road, riding at a rapid pace, but without noticing him in any way. Shortly after he met a third, who pulled up and inquired who he was. Upon finding that he was the officer who had been sent to Toro to destroy the bridge, he said, 'Come along with me, Lord Wellington is anxious to see you.' The information the officer was able to give his lordship as to the exact position of the enemy was exactly what he wanted, namely, whether the enemy had crossed the river at Toro, and, if not, the length of time that would be required to repair the bridge and make it passable for troops of all arms."

MEMORANDUM ON TOPOGRAPHY FOR THE MILITARY COLLEGES.

THE following Scale of Shade and Instructions for representing ground in Military Plan Drawing, have been approved of by his Royal Highness the Field-Marshal Commanding-in-Chief, and have been introduced at the Staff College, the Royal Military College, and the Royal Military Academy.

SCALE.

Table showing the number of Strokes per inch, and the thickness of the strokes employed in the construction of the scale of shade.

Angle of Inclination.	No. of Strokes per inch.	Thickness of Stroke.
35°	32	$\frac{1}{30}$ inch.
25°	32	$\frac{1}{70}$ "
20°	30	$\frac{1}{80}$ "
15°	28	$\frac{1}{110}$ "
10°	24	$\frac{1}{130}$ "
5°	18	$\frac{1}{220}$ "
3°	14	$\frac{1}{300}$ "
2°	10	$\frac{1}{400}$ "

From 35° to 45° the lines may increase in thickness according to the draughtsman's skill.

INSTRUCTIONS.

1. The shading produced by pen or pencil strokes drawn in accordance with the above scale, is to be based on contours 'traced at equal vertical intervals of 25 feet, or a convenient multiple thereof. All slopes exceeding 45° are to be shown as broken ground. The interval between 45° and 35° (the latter being the highest grade provided for in Colonel Scott's scale) is to be filled with hachures of increased thickness.

2. The pen or pencil strokes are to be drawn on the horizontal system.

3. The shading so produced is to be proportioned to the slopes without reference to their altitudes above the sea; and none of the effects which would be caused by side illumination are to be employed.

4. The contour lines used as the basis of the work are to be indicated by coloured, or, when that may be impracticable, by dotted, lines, and they are to be marked by numbers representing their relative altitudes above a datum assumed, according to the character of the surrounding country, at 100, 500, or 1000 feet below the lowest point of the ground sketched.

5. The vertical intervals between the contours are to be notified in the margin of the plan, and also the distance of the assumed datum below the lowest point of the ground represented.

6. All the more important features are to be marked with bold figures in coloured ink, representing their order of position in altitude; the highest being marked 1.

7. When, owing to some peculiarity in the formation of the ground, the direction of the fall is not clearly apparent, arrow-headed lines are to be introduced pointing down the slope.

8. A scale of miles is to be drawn on every plan. This scale is to be subdivided into portions representing some convenient multiple of the English yard.

THE PRINCIPLES
OF
ROAD - MAKING.

ORIGINALLY EXTRACTED

(FOR THE USE OF THE STAFF COLLEGE) FROM A PAMPHLET BY
MAJOR JOHN PITT KENNEDY, UPON "ROAD-MAKING IN THE
HILLS;" "THE AIDE MÉMOIRE TO THE MILITARY
SCIENCES;" AND OTHER WORKS.

THIS Treatise is introduced here in the hope that it
may be occasionally useful to officers of the army.

CONTENTS.

	PAGE
A perfect road defined — Road-making divided into two branches: 1st, the laying out of the line; 2nd, the construction of the road — General principles — Correction of errors in existing roads — Cuttings and fillings to be avoided — Obligatory points — Contoured maps — Zigzags — Marking out the line — Table of gradients — Dinometer — Boring rods — The lock-spit, importance of — Appearance of gauge line — Deviations — Construction of road — Curves — Cross sections — Drainage — Foundation, or soling — Retaining walls — Materials for fences, &c. — Settlements — Metalling — Estimate of cost — Temporary tracks over difficult places — Military Roads — Corduroy Roads — Plank roads	149-175

THE PRINCIPLES OF ROAD-MAKING.

AN acquaintance with the principles of road-making may often be of use to a staff officer. He may have to make a road from one military post to another, or he may even be entrusted with the charge of opening up a country by constructing roads throughout it.

A perfect road may be defined as that in which its course is perfectly straight, its line perfectly level, and its surface as hard, smooth, and non-elastic as possible.

Road-making may be divided into two branches:—

First, the laying out of the line.

Second, the construction of the road.

Laying out of the line:—

The first care of any person who is entrusted with the charge of initiating the improvement of a district of country by the construction of roads should be to consider the features of the country, not only within his immediate district but far beyond those limits.

He should divide his road project into three distinct classes. The first, and most important, containing the lines of general intercourse; the second containing the roads for merely local objects, and communicating with those of the first class; and the third containing the farm roads communicating with those of the second and first. He

should not upon any account permit the perfection of his roads of the first class to be in the slightest degree injured for the benefit of those of the second and third classes. His great lines of intercourse must be laid out solely with reference to the features and general levels of the country, and to the permanent markets to which producers may afterwards have to convey their goods. If he think only of his own little district at this point of his operations he will materially injure it, as in that case his general lines will probably not be such as to invite general traffic, and the mercantile interests of his district will be proportionally impeded. The co-operation of the circumjacent neighbourhood is essential to the improvement of any given spot of country, and must be earnestly sought for.

Should the object be merely the construction of a road between two military posts, the above considerations need not be taken into account, but the following rules are applicable to the laying out of all roads.

1st. That the line must never rise or fall unnecessarily.* It must go round or cut through impediments.

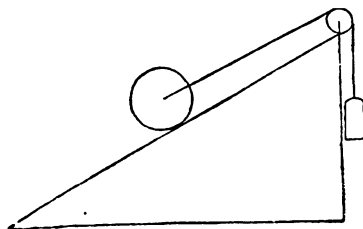
2nd. That the quantity of ascent or descent, when such is unavoidable, should be divided uniformly over as long a distance of the line as the nature of the ground will permit, and thus the inclination at each particular part will be reduced to the smallest possible rate.†

* In ascending a hill, the line of road should constantly rise, it should never fall. In descending it should constantly fall, never rise.

† Some persons contend that it is better to have an undulating road, under the idea that the succession of ascent, level, and descent is better for the horse, and allows one set of muscles to rest while another set works; but this is a popular error which should be discarded. See Gillespie on Road-making, page 37.

We should recollect that the loads carried along roads by any given power must be small in proportion as the inclination of the hill is great. That the steepest hill, in fact, regulates the load.

Careful experiments have been made as to the resistance to traction on various kinds of roads ; but without entering into such scientific details, it will be sufficient to bear in mind that on an inclined plane of which the surface is hard and smooth, when any power holds a heavy body in equilibrium, the power exerted will have the same proportion to the weight as the height of the plane bears to its length (*see diagram*) ; and secondly, that whilst the effect of the load increases, the power of the animal employed to draw it diminishes in proportion as the degree of inclination increases. These two facts should never be absent from the road-maker's mind.



Correction of Errors in Existing Roads.

When this subject is fully understood, it will be evident that the ignorance of a person who undertakes to lay out a road may, and very often does, make the transport of commodities amount to many times what it should cost. There is little doubt that the greater number of the hills we generally find on roads might have been either wholly

avoided, or their inclination very much diminished by judicious laying out; and the evil is that the only wise remedy for such blunders is to make a new piece of road where they exist, or if they are numerous to change the entire line. The common mode of correction is to cut down in some degree the hill, and to fill up a little the hollow; but this method rarely reduces the inclination as low as the natural features of the ground would allow; and it generally costs much more than would be necessary to put the road in its right place by laying it out afresh.

The correction of hills on old roads is alluded to here to show the importance of extreme accuracy and sound principles in selecting an original line. Every person who is about to lay out a road should thoroughly understand that if an error be made it cannot be completely remedied without abandoning that portion of the road where it exists, and taking up a new line, thereby losing the capital already spent, and rendering a further expenditure necessary, besides injuring the speculators whom the road may have brought there. An error in the selection of the line is therefore fatal; but an error of construction merely, such as the use of soft materials instead of hard, or the like, can be set right without abandoning the old line.

Cuttings and Fillings to be Avoided.

Although the most perfect form for a road is that of the straight and level course, and although the power of obtaining such a road by cutting through hills and filling up hollows is not disputed, yet the expense of such cuttings and fillings is so enormous, that to think of them for ordinary roads is out of the question. In laying out a railroad

this method must, within certain limits, be adopted, because the velocity of the steam-carriage will not allow of such rapid curves as a road must take which follows the natural inflexions of the hills, but the system is too costly to be applied to ordinary roads. It will therefore generally be necessary to make these roads wind round the hills and valleys instead of cutting through the former and filling up the latter.*

No person who is not thoroughly acquainted with the system of laying out a road upon the most scientific principles should therefore attempt such a task. Most amateur artists are time-killers and money-wasters; but of all the amateurs in the world the road-maker is the most mischievous. There is no way of avoiding his ingenious contrivances to harass the weary traveller, and reduce the profits of industry.

Obligatory Points.

The first thing to be done when it is determined to open a road between any two points, if they be distant, is

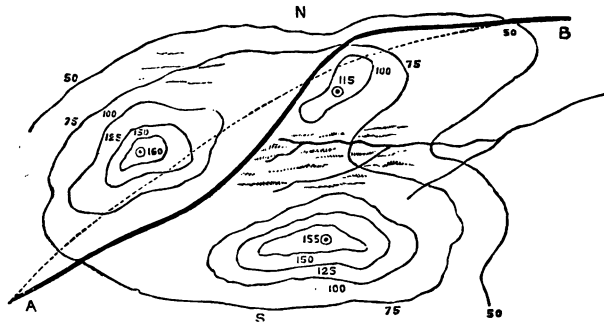
* It is difficult to persuade a beginner of the advantage of going round a hill instead of over it, when by the latter course the length of the road may apparently be shortened and the gradient only slightly increased. The following illustration, given in Gillespie's "Manual of Road-making," will show that a road may often go round a hill without at all increasing its length:—

"If a hemisphere (such as half a bullet or half an orange) be placed so as to rest upon its plane base, the halves of great circles which join two opposite points of this base are all equal, whether they pass horizontally or vertically; or let an egg be laid upon a table, and it will be seen that if a level line be traced upon it from one end to the other, it will be no longer than the line traced between the same points but passing over the top."

to get the maps of the country, and to become thoroughly acquainted with every inch of the intervening ground in all directions, *particularly the course of rivers.*

If it be a hilly country the greatest possible attention must be given to choose the lowest available passes of mountains, and the highest available passes of valleys, which in all cases must be considered as *obligatory points* of the line. The selection of these is, therefore, the first and most important point of laying out, and nothing short of mathematical proof of their superiority over all other points should satisfy the road-maker that he has selected the right points.

This operation is much facilitated by the possession of a contoured map of the country, showing the actual levels of its features. With such a map, the line of a road may be projected in the closet as well or even better than on the ground itself.



Let the above diagram represent a contoured plan of a country in which a road is to be made from A to B. The best line is evidently that marked in the diagram,

for if any other direction (such as the dotted line) be chosen, the road will *unnecessarily rise and fall*; or should the line be chosen to the south of that marked in the diagram, it would have to cross two rivers and marshy ground.

When no such contoured plan exists, the want must



be remedied by increased industry in personally examining the country with a view to the selection of the line.

The most disadvantageous circumstances under which it can be required to lay out a line of road, is where its direction runs at right angles across a line of hills to the

passes of which there are no convenient approaches by means of under features; this obliges us to resort to the expedient of zigzags. There is no difficulty in laying out such a road to any required degree of inclination, but when done it is always dangerous, as it is not possible to avoid very acute angles, which on a declivity are most objectionable. If an animal run away with a carriage in descending such a road, the first turn he reaches will probably finish the mortal career of the whole party. Another objection to zigzags is that in going up hill the whole strain at each turn falls upon the two shaft horses, as the leaders are unable to assist in drawing until the corner is turned.

The rule in such a case must be to make as few turns as possible, and in general there need not be more than one on each side of the mountain. (*See diagram, p. 155.*)

Marking out the Line.

Having now by means of maps and personal observation, and by taking levels, obtained a knowledge of the relative heights, and having thus selected the general line of the road and fixed all obligatory points, we may proceed to the operation of marking out the exact line between all the points thus selected.

The first step is to observe with a theodolite the general angle at which it will be necessary to ascend or descend between each pair of obligatory points. This will serve as a guide to the gradient to be adopted (making allowance for the increased length of the road due to the sinuosity of its course along the hill side), and which gradient should rarely exceed one foot in 33.

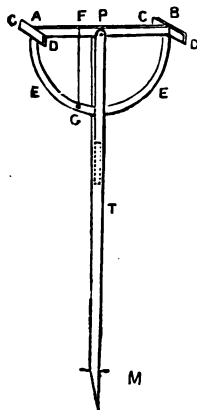
The following table of gradients* will be useful at this stage :—

Gradient.	Vertical rise in a mile.	Vertical rise in a chain.	Angle which gradient makes with the hori- zontal.
1 in 10	528·0	6·60	5 42 58
" 15	352·0	4·40	3 48 51
" 20	264·0	3·30	2 51 21
" 25	211·2	2·64	2 17 26
" 30	176·0	2·20	1 54 37
" 33	160·0	2·00	1 44 12
" 35	150·9	1·88	1 38 14
" 40	132·0	1·65	1 25 57
" 45	117·3	1·47	1 16 24
" 50	105·6	1·32	1 8 6
" 55	96·0	1·20	1 2 30
" 60	88·0	1·10	0 57 18
" 65	81·2	1·02	0 52 54
" 70	75·4	·94	0 49 7
" 75	70·4	·88	0 45 51
" 80	66·0	·82	0 42 58
" 85	62·1	·78	0 40 27
" 90	58·7	·73	0 38 12
" 95	55·6	·69	0 36 11
" 100	52·8	·66	0 34 23

Long picquets with flags are then set up in the required slope by means of the plummet level, or a spirit level having a graduated vertical limb. A very cheap and convenient instrument for this purpose is shown in the diagram (p. 158). It can be made by any carpenter, and is sufficiently accurate for the laying out of all ordinary roads. AB is a brass or wooden rule about a foot long. At right angles to it are fixed two cross pieces CD, about three or four inches in length. The upper edges of these three rules must be in the same plane.

* From the "Aide Mémoire."

The rule A B is fixed to a semicircle E E. From F hangs a plumb line F G. The rule and semicircle are then fixed in a piece of wood ; the upper part of which is cut



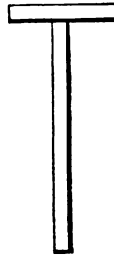
to let the semicircle play backwards and forwards on a pivot P ; and the lower part (dotted in diagram) fits into a stick T about $3\frac{1}{2}$ feet long, and having an iron point with four projecting pieces of iron M to prevent its going too far into the ground. At G a scale is let in to the semicircle at right angles to F G, and divided into tenths and hundred parts of the distance F G. By moving the semicircle on its pivot till the plumb line coincides with the divisions of the scale, any required slope can be given.

These long picquets may be placed at intervals of about 100 yards, more or less, according to the bends in the hills, taking care to place one at every salient and every re-entering angle of the ground ; and that from each picquet the one on either side is distinctly visible. We proceed thus until the whole line is picqueted off, observing to correct this line if requisite ; and it rarely happens that the picquets can be placed precisely in their right position at the first trial.

Having got the long picquets accurately placed, the ground should be distinctly marked at each picquet by cutting a cross, or by driving a short picquet home, or by some other convenient sign ; and the second operation must be effected by placing short picquets, by means of the *boning rods*, at intervals of about eight yards between

the long picquets. Boning rods are simply uprights of equal heights, with a cross piece of wood at the top. Three are required in the above operation.

Having placed the short picquets, long lines are then laid to the foot of the picquets, taking care that the lines run *round* all obstacles (such as rocks or lumps in the ground) and not *over* them. When these lines are fixed, some expert labourers, accustomed to the work, may be employed to cut out a line exactly to the level of the line. This is called the lock-spit.



Boning Rod.

This operation should be performed with great accuracy, so that there may be no necessity for correction afterwards; and handy men accustomed to the work should be employed in lifting the lines and laying them again as the lock-spit cutters proceed. The lock-spitted line, being the sole regulator of the levels, must be examined and re-examined to ascertain that in every part it has been accurately cut. The person charged with such a work must not spare himself at this point upon any account. Let him then bring every one in the neighbourhood, whose opinion is worth having, to visit and criticise what he has done; let him reflect that by any idleness or stupidity on his part he passes sentence upon countless generations to suffer inconvenience and unnecessary toil for his omissions. The lock-spitted line when completed is not to be considered as anything but a gauge for the general level of the surface of the road; but as such it should never be lost at any future stage of the construction of the road, which it is apt to be unless care is taken. It is not the

centre of the road, as some suppose, although, as a general principle, the nearer the centre line comes to it the cheaper will be the construction of the road; and the more we diverge from it the more costly will be the construction of the road where the features of the country are of a hilly character.

This gauge line or lock-spit when completed ought to exhibit either a perfect level or a perfectly uniform incline between every two of the obligatory or main points; and following every horizontal inflection of the ground, it ought to stand the test of any instrument, and be pleasing to the eye. The economy and perfection of the work will be in proportion to the judgment and accuracy applied in the laying out and making of this gauge line, as it gives the key by which to regulate with the utmost precision every subsequent effort of every labourer we employ, and to point out where every spadeful of excavation is to be dug and permanently deposited with the smallest amount of exertion.

With the completion of the above described lock-spitted mark, neatly cut along the whole length of the projected road, we shall consider the business of laying out the line to have been executed; and in order the more clearly to separate this most important operation from all others, we shall consider the subsequent picqueting, cuttings, and marking off the details as appertaining to the subject of *construction*.

Deviations.

Before quitting this part of the subject, it may be well to notice the deviations which may be made in the line of a road in order to avoid obstacles. Such a deviation is

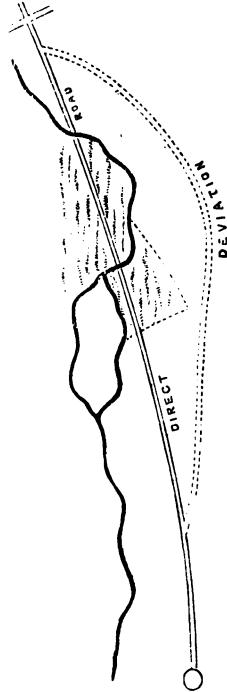
shown in the annexed diagram,* where, by a simple and obvious departure from the straight line, the road avoids a swamp (over which it would have to be carried by an embankment) and a river which it would have to cross twice by bridges.

We shall now proceed to the subject of

Construction.

As soon as the lock-spitted gauge line shall have been well considered and criticised, and all necessary corrections completed, it may be widened into a five-foot track. The next operation is to fix the picquets for the centre of the road.

This will regulate, first, the cost, and, secondly, the appearance of the work when complete. The road-maker must avoid objectionably sharp turns; but he must also studiously avoid heavy cuttings and fillings, and he must make his curves regular. These three points can generally be combined; and they must be combined, or the road-maker cannot be qualified for his charge. He should never have his eye off the gauge line, and as each picquet is placed it should be accompanied by a mental calculation as to the quantity of cutting and filling (and consequent cost) it will require to



* From the "Aide Mémoire."

bring the road at that point to its proper width, and to the level of the gauge or lock-spit. He will bear in mind that as often as he can place a picquet exactly at the lock-spit without infringing on a principle, he should do so ; as then the forming of the road will cost the least possible sum (except when he has to deal with rock which requires blasting). He must at all times think of his finances, taking care that the amount of money or labour estimated for the work shall be made to complete it ; and he will be justly blamable if it fall short, as this circumstance is very rarely attributable to any other cause than his own unfitness as a superintendent. The wrong placing of a few picquets may cause a piece of work to cost double or tenfold what it should cost.

It is evident that there may be a very great variety of curves made for rounding off the angle which the lock-spitted gauge line forms in passing a valley or ravine, and that the more the curve is carried out from the angle the better will be that particular part of the road ; but it must be recollected that the slight improvement thus effected at one spot is attended with most disproportionate cost ; and if a man deficient in judgment be placed in direction of such works, he may use very fine arguments as to the utility of gradual curves, and the like, but the result will be that, instead of opening his road in its full length, he will find all his money expended on two or three fantastical embankments, and will leave the district as closely sealed as he found it. If he desire to serve his own reputation, and to be useful to his neighbours, he will follow as nearly as possible the natural features of the ground, unless when there is the most indisputable reason against it ; and keeping a watchful eye upon the

money chest he will never sacrifice the general result to any chimera whatever. This cutting and banking mania is the grand source of wasteful expenditure in the construction of our roads. If instead of going uniformly along the side of a hill, and making his road with the minimum of cutting and filling—if instead of this he seek to torture it into straight lines, still keeping to certain predetermined levels, the line of road must be a succession of deep cuttings and high embankments, costly at first, and costly to the last from their liability to dilapidation.

As soon as the centre line shall have been cautiously picqueted out, all the side lines must be measured from it, and distinctly rutted out upon the ground, taking care to lift these several shear sods. These sidelines mark the breadth of the road (which may be made from eighteen to thirty feet, according to circumstances), and will show the verges of the road, the inside and outside of the fences (when such are made), the width of the footpath, if required, the width of the water tables, as well as the position of the catch-water drains. Accurate *bonings* must be put up at every picquet in the centre line, which will thus be level with the opposite picquet of the lock-spit gauge; and a correct longitudinal section must be made up between these picquets.

Cross sections should also be made up to the intended level of the road at every hundred yards, showing the precise fall that the road is to have from centre to each side when formed. Upon this point much difference of opinion exists. Some authorities recommend that the cross slope of roads on declivities should run the whole way from the outside verge to the inside, while others advise just the contrary. The chief object of the first recommendation is to prevent the corrosion of the outside verge by the

surface water ; and that of the second, to prevent any accumulation of water in the water tables ; but they both appear to be objectionable in practice, both by giving a longer run to the surface waters on the road, and thus injuring the surface, and by throwing every carriage off the level. The best form of cross section, therefore, is a fall from the centre to both sides. The destructive effect of surface water is thus reduced to a minimum, and carriages are enabled to maintain a level position by keeping in the centre of the road.

The cross slope given to a road should vary according to circumstances. If its maintenance and repair be carefully provided for, on level ground a fall of 1 in 24 from the centre to the sides will be sufficient. If there be any doubt as to the future care, the best precaution is to increase the cross slope as a security against surface water, and in all cases it is well to make the cross slope somewhat greater on declivities than on level ground, in order that the path of all surface waters may be directed in the shortest lines to the water tables. Under these different circumstances the cross slopes may be made to vary from 1 in 24 to 1 in 12, and they should be accurately proved by the section level. The angle A in the centre of the road should, of course, be rounded off thus—

In making up the longitudinal and cross sections it is necessary to observe whether the soil be of such a nature as to answer for the *soling* or foundation of the road ; or whether it be of so defective a quality as to require a superstratum to prepare it to receive

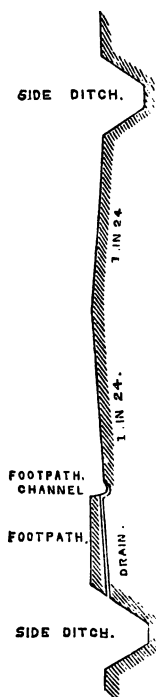
the broken stones (metalling) or surface gravel; and a corresponding distinction should be made in the height to which the section lines should be raised in different places. If the natural soil be of the right quality for soling a road, it would be unpardonable waste to require that more of the same or other material should be excavated elsewhere and brought upon it. As soon as the longitudinal and cross sections have been made up to the right level, the work may be considered in a state to employ large forming parties, who, after this preparation, can scarcely commit errors if there be any degree of activity in the overseers.

Drainage.

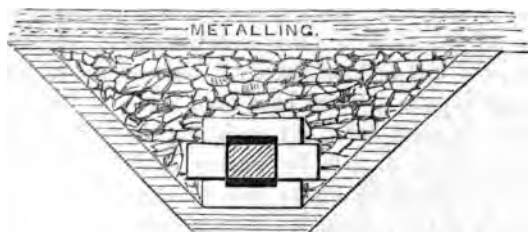
The drainage of roads is a very important subject. When the road is constructed on level ground it is desirable to cut a ditch on each side of sufficient size to catch all the surface water which may fall on the road, and of such a depth and with such a slope as to conduct the water freely away. When footpaths are to be constructed at the side of the road a small channel should be made between the road and the footpath, and small drains formed of tiles should be made under the footpath at such a level as to carry off the water from the channel and convey it into the side ditch. (*See diagram.*)*

Besides this *surface* draining it may in some soils be

* From the "Aide Mémoire."



necessary to adopt means for maintaining the *foundation* of a road in a dry state by small under drains, about four inches square, running across the road and underneath the metalling. (*See diagram.*)*



In mountainous countries large drains should also be constructed underneath the road at every re-entering angle, so as to carry off the torrents which come down the ravines. These last should be large enough on the outside to admit a man inside them to repair them.

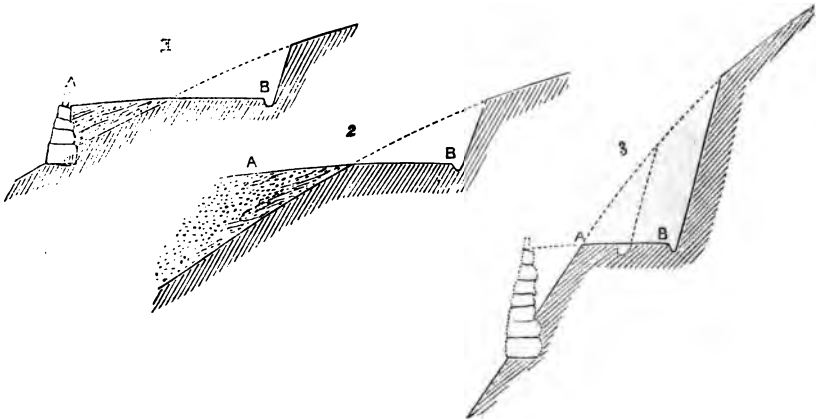
Foundation or Soling.

In gravel soil the foundation of the road may (as has been already said) be the natural soil itself; but in a soft, clayey, or boggy soil, a solid foundation must be made on which to form the road. This foundation may be made of concrete or of pavement with large stones, or in spongy, boggy soil, even of faggots formed of brush-wood, heather, or gorse. It is very important that this substratum should be firm, solid, and dry, so that it may last for years, while the outer coating or metalling alone requires to be renewed from time to time.†

* From the "Aide Mémoire."

† The great road-maker Macadam, however, maintains that no foundation of large stones or faggots need be made, even in a bog! He recommends that the foundation should be formed of small broken

It is evident that in constructing a road on sloping ground, the superintendent who wishes to execute his work with economy must use every exertion to provide that the quantity of cutting shall as nearly as possible agree with the amount required for filling, so that he may not be obliged to carry material either to or from the place where he works. This, however, cannot always be accomplished, as it depends very much upon the steepness of the hill along the side of which the road is carried. In diagrams 1 and 2* this may be effected; but in diagram 3 the steepness of the hill side is such that the earth thrown over the side would not stand unless supported by a very high retaining wall, as shown by the dotted part of the diagram. In this case, therefore, the whole width of the road A B must be cut into the hill side.



stones exactly the same as the surface, and he prefers a road so made over a bog to one made on hard rocky soil; he says it lasts longer.

* From vol. vi. "Royal Engineer Papers."

Retaining Walls.

Wherever a retaining wall is built on the side of the precipice, as in figure 1, it must have a parapet of 2' 6" raised above the level of the road, and small "weep holes," four inches square, must be constructed under the parapet at every fifty feet, for the escape of the water. These retaining walls should be built on sound level foundations, and when built dry should have a slope of $\frac{1}{4}$ of their height, and a thickness at the foundation of $\frac{1}{4}$ of the height, plus 2' 6". It is not advisable that these walls should generally be more than four feet high exclusive of parapet, although many emergencies will render much higher walls occasionally necessary, but they should then be constructed of regular masonry work.

Materials for fences, for facing embankments, &c.

The materials used for fences, for facing embankments, &c., will depend in a great measure upon the nature of the soil; and the best proof of skill in this or any other art is the power of making the utmost possible out of the circumstances in which we are placed. When the soil is stony, the fences and the faces of the embankments would naturally be made of this material, and when built dry these last should, as before said, have a slope of $\frac{1}{4}$ of their height. If sod work be used the slope should be increased to $\frac{1}{3}$ of the height; and when a bank of earth or other material is faced without being supported, the slope will depend upon the nature of the soil and the natural slope at which it will stand, and which is generally at an angle of 45° , that is, with a base equal to its height. The best soil that we can meet with in constructing roads is

gravel, because, in the first place, it has natural drainage; secondly, when the road has been formed in such a soil it is both soled and metalled, unless the traffic be of a very heavy description.

Settlements.

In making a road through any spongy or soft soil, it is well to let the work season after the general drainage and forming have been effected, before proceeding further. When embankments are filled up a considerable allowance must be made for sinking; and after allowing them to season they should again be levelled up. If these points be not attended to, or if the work be hurried over, it will look well at first, but afterwards it will show many inequalities and defects that might have been avoided.

Metalling.

Roads can be metalled either with gravel or with broken stone. If with gravel, care must be taken that it should not be overcleaned, but that sufficient of the natural loam belonging to it should be retained, so as to bind the gravel together. If, on the other hand, broken stone is employed, these cannot be too free from soil, as from the nature of the angular pieces they dovetail into one another. The toughest stone is the best for the purpose, such as granite and basalt. The softer stones, such as sandstones, are not fit, as they are soon ground into powder by the carriage wheels; while limestones are also objectionable on account of their affinity for water, which causes them to pulverize by the action of frost. For a similar reason chalk is bad for metalling; but it may be used as a foundation at such a depth as to be beyond the influence of frost. Every road superintendent

should understand the difference in the quality both of gravel and stone, and the precise kind of stone required should always be specified in the contract; and he should bear in mind that the *best* stone is the least costly in the end. The metalling should be spread over the road to the depth of about six inches. The road should then be well rolled with a heavy roller before it is thrown open to the public.*

Estimate.

When we estimate the cost of a new road, we should divide the whole into three distinct heads.

The first may include all the expenses of surveying, laying out, forming, draining, fencing, soling, and all else preparatory for the metalling.

The second head should show the cost of the metalling, and should specify the quality of the stone required, and the quantity per perch.

The third, the cost of the masonry, bridges, pipes, and tunnels, if any.

The details included under the first head are such as are required, with but little variety as to their application, in all projects for new roads; and their cost will vary according to the nature of the country, and the soil in which we are working. The second head, or metalling, may be either wholly omitted in certain cases, or it may be adopted to any degree that the circumstances render necessary. The third general head, including pipes and masonry, is also capable of being executed in various degrees of excellence, and at proportionate rates of cost,

* The way in which the metalling of roads in England is left to be ground down by the feet of horses and the wheels of carts and carriages is a disgrace to civilization.

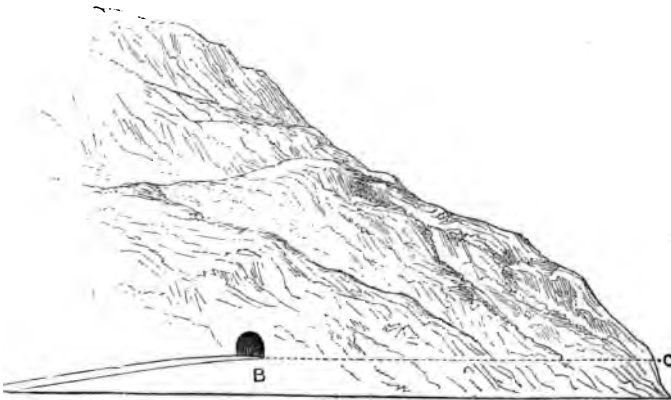
which can only be determined by comparing the necessity of the work with the funds applicable for its construction.

A few details of construction may not be unwelcome here.

Temporary Tracks.

In opening the first five-feet track in a mountainous country, where very difficult cliffs occur in the line, temporary tracks may be made either above or below the proper level, as the nature of the case may admit, taking care, after passing the obstacle, immediately to regain the proper level. By this means an immediate passage can be obtained long before the permanent passage could be made in its proper position. It is better that these temporary passages should be *above* rather than *below* the proper level, because in that case the progress of the permanent road need not be interrupted by persons passing along the temporary track.

In like manner, if we come to a place B, where it is



desirable to make a tunnel, a temporary track B, C, may be carried round the hill to a point on the opposite side on the same level with B, from whence the road may resume its gradient after passing through the tunnel. Should the hill run right across the direction of the road, the temporary track B, C, may be zigzagged over the hill and down the other side to the opposite entrance of the tunnel.



In cutting tunnels through rocks, and in working down cliffs, it will be necessary to blast the rock with gunpowder. This operation is performed by mines, which when small, and not above eighteen inches deep, are made with the borer and hammer. If larger or deeper they are made with the jumper. The charge of powder depends very much upon the nature of the rock to be blasted. Some rocks are more effectually split by a small charge of powder than by a large one. If a mine do not explode at the time expected, great caution should be used in approaching it. Accidents frequently occur in blasting by persons going too soon to see whether the match has gone out, when the mine often explodes just as they reach it.

In constructing a long line of road, the whole length should be divided into districts, each under a superin-

tendent, who should divide his men into so many parties, each under an overseer. Weekly reports of the progress of the road should be sent by each superintendent to the person who is in charge of the entire work.

Military Roads.

While all roads should be made upon the foregoing general principles, there may be occasions on which an officer may be required to construct a temporary road for the immediate passage of an army with whatever material he may find on the spot, and when time will not admit of much nicety either in the laying out of the road or in its construction. It is upon such occasions that an officer will have to make a practical application of the knowledge he possesses, and to trust to his own resources in turning to the best advantage whatever material he may find at hand. For instance, should he have to make a road fit for the passage of artillery over a boggy or soft place where he can find no rocks or stones wherewith to make a solid foundation, the difficulty may be overcome by cutting branches of trees and making them into faggots, which, as well as heather, gorse, or even rushes, make a good foundation for roads, and, when covered with earth or gravel, a road may quickly be formed well adapted to the passage of an army. In such temporary military roads, the gradient of 1 in 33 need not be observed; a gradient of 1 in 15 would be admissible.

Roads may also be made, as in America, with trunks of trees or planks. The first are called "Corduroy" roads, and are constructed of logs of rough timber (fir trees) laid side by side across the proposed route; a

roadway is thus very quickly formed which will last for years. These "Corduoy" roads are chiefly resorted to in traversing woods where wet or swampy ground and quagmires occasionally occur, and also in heavy soil liable to be worked into deep holes by the passage of heavy waggons. When constructed in patches, merely to bridge over an occasional obstacle, the logs are laid on longitudinal sleepers, and outside ditches are cut as in other roads; but the simple laying down of logs (lopped of all branches, and from 8" to 10" in diameter) close to one another and side by side will give a very effectual surface drainage; and by distributing the weight of a moving mass over the whole width of the roadway it keeps the track free from holes and mud. The ordinary rates of travelling are not so much decreased over these roads as might be supposed. Light vehicles can easily make from 5 to 6½ miles an hour.

Plank roads are thus described by Sir Francis Head. A small gang of men with spades and rammers quickly level one end of the earth road. As fast as they proceed, four or five rows of strong beams or sleepers are laid down longitudinally four or five feet apart, and no sooner are they in position than stout planks touching each other are transversely laid upon them. A thin layer of sand or grit is then thrown upon the planks, which instantly assume the appearance of a more level Macadam road than in practice can ever be obtained. A road of this description will last from ten to twelve years, and it is found quite unnecessary to spike the planks to the sleepers. It admits of easy repair.

A road sufficient for the temporary passage of troops may be merely cut through a forest or jungle, and the

natural surface of the earth will often be found sufficiently firm in fine weather to bear the temporary traffic required.

The principles of road-making as detailed in this pamphlet are sound, general, and simple; but the application of them under various circumstances is often a matter of difficulty, and requires much practice and experience, depending much also upon the nature of the country, and the talent and knowledge of the individual employed.

THE END.

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